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MUNICIPAL ENGINEERING

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A MUNICIPAL BUSINESS MANAGER, IN STAUNTON, VA.

By Ernest Smith Bradford, Washington, D. C.

WHEN the City of Staunton, Virginia, cast about for a plan under which the efficiency of its municipal government might be increased, the Council Committee, after study and much correspondence, decided that the Galveston-Des Moines plan promised most and ought to be adopted. Commission government, a municipal board of directors, had greatly improved conditions in Galveston, Houston, Topeka, Dallas, Des Moines, Cedar Rapids, and a dozen other cities. Why not Staunton, Va?

But the Constitution of Virginia prescribes rigidly the form of city government for all municipalities of the first class. Staunton has more than 12,000 population, and, therefore, is a city of the first class. Such a city, according to the Constitution, must have a mayor and a council of two chambers. Since they could not legally abolish mayor and council for a Board of Commissioners and an amendment to the Constitution was not feasible, those who favored a change worked out, after much thought, a practical plan. It was nothing more nor less than the creation of a new office, City Business Manager, authority to appoint new officers being specifically given in the city charter. So after much discussion and some opposition, early in 1908 the new plan was adopted.

Retaining the mayor and council as previously, the ordinance (Jan. 13, 1908) created the office of general manager for the city of Staunton, to whom was given (1) entire charge and control of all the executive work of the city in its various departments, and entire charge and control of the heads of departments and employees of the city.

His duties, in addition, are (2) to make all contracts for labor and supplies and "in general perform all the administrative and executive work now performed by the general standing committees of the council, except the Finance, Ordinance, School and Auditing Committees." Besides, "the general manager shall discharge such other duties as may from time to time be required of him by the council."

These other duties consist in hearing all complaints of citizens; of advising and assisting the Council in making up the yearly budget of expenditures; and of overseeing all the work of the various departments. Under his direction are a superintendent each of (a) streets; (b) electric lighting; (c) waterworks; (d) the city park; (e) and an overseer of the poor. The general manager does not directly look after all the details of these departments, but through their superintendents supervises and directs.

To his municipal duties the manager devotes his entire time. He is appointed by the council for the term of one year; and is required to give a bond for $5,000.00 before entering upon his office. His salary is $2,000.00 a year.

What have been the results of this change of government? In the first place, all of the business activities of the city have been brought together under a single head, closely co-ordinating the work of the different branches. In former days, when the waterworks department wanted to haul pipe from a freight car or a yard to the street where the trenches waited for the laying of the mains, it had to hire teams, though city horses and wagons stood idle in the stalls, for these horses and wagons belonged to the street department, not to the water department, and there was no one to see that one branch

of the city's working force helped the other. In municipal affairs the policy was apparently "let not thy right hand know what thy left hand doeth." Such a condition is unheard of at present. The city manager knows what work is going on in the departments; and when the water department is ready for the pipe, the teams of the Street Department are on hand and the pipe is delivered promptly. So all parts of the machine work together.

In the second place, there is a purchasing agent for all city supplies—a single head whose duty it is to know market prices, buy as cheaply as possible, and get good quality. Formerly each council committee looked after the purchases for its division and there was no one whose business it was to look sharply at the items of cost. The saving in this respect alone has been great. Cylinder oil, which used to cost the city 79 cents a gallon is bought now for about 50 cents. No drop in the market price will account for such a difference. Granolithic paving, for which the city used to pay $1.75 a square yard is now done for less than $1.00. Water pipe costs less than formerly. Old boilers and junk are sold instead of being allowed to rust away; and in many ways it is apparent that the municipality has a business head. While impossible to prove absolutely, in the absence of accurate data on the expenditures under the former system, it is fairly certain that in the past ten or eleven months the $3,500 or $4,000, which the manager's office has cost, has been more than saved by close buying, more careful use of city property, and the utilization of waste time of city employees.

The city books are well kept and are open to inspection at any time. The manager's assistant, S. D. Holsinger, will tell you any evening at the close of business, just how the city stands financially, in each fund. Bills are paid promptly every month and collected promptly. The Council controls all expenditures. The city manager's proposed outlays are first authorized by the council, whenever the items amount to over $100. After the amounts have been expended, the bills are audited by council's auditing committee. In this way the manager's expense items are subject to instant authorization and to auditing—a check more than sufficient. But though legally the council is responsible for all expenditures, it depends to a great extent on its general manager for practical advice as to how much to spend in each department and the best way to spend it. It has employed him to "manage" and expects him to do so.

Mr. Chas. E. Ashburner, a civil engineer of Richmond, Va., is the present manager of the municipal corporation; a vigorous, young man of ability. His one assistant keeps the minutes of the committee meetings, for council committees meet regularly with the business manager, attends carefully to the records, bookkeeping, notices to citizens, etc. The day at the office is a full one, complaints, requests for information, bills to examine, to charge to the right accounts and file; a council committee meeting or two; engineering work to superintend (for the business manager is also City Engineer), contracts to draw, supplies to inspect, letters, reports of employes, these are all part of the day's work. The management of the business of a municipal corporation takes thougnt and care and prompt action as well as that of any private company.

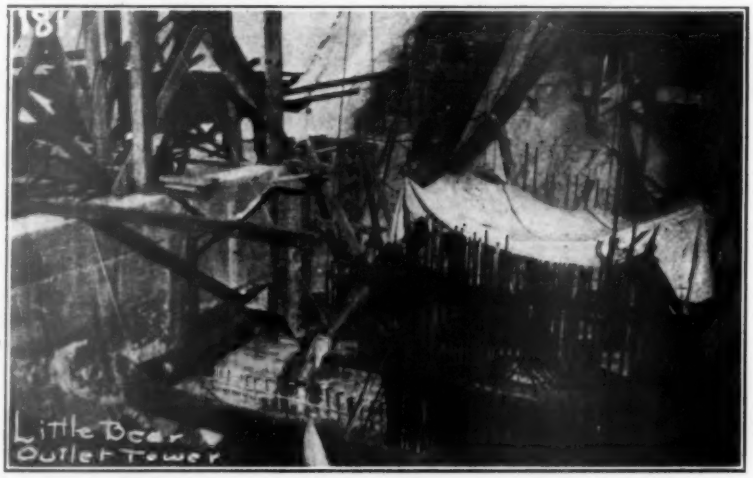
In Staunton, then, we have a variation of the commission plan. With little legal change in the city government, there is a great practical alteration. Mayor and Council have a paid man to assist them in determining what expenditures to make, and how to expend wisely. But here is the combination, again, of the legislative or policy-determining function with that of the executive, or policy-executing power. It is seen more and more to be of disadvantage to try to absolutely dissever the two. The Galveston plan combines them, the Des Moines plan combines them, every corporation combines them to a greater or less extent. Is it possible that we have carried too far our old idea of the separation of governmental functions? Are we to follow hereafter in municipal government the system of business corporations rather than a time-honored theory of government? The many experiments now being tried by American cities will soon determine.

In the meantime, the city of Staunton is unique in having probably the only business manager in the country. Its success so far is attested by mayor, councilmen and business men. During the few days spent there, I tried to discover all possible objections to the plan, but, except for one or two contractors, reports were uniformly favorable. Citizens are disposed to give the new system a fair trial; and every student of municipal affairs will watch with much interest the outcome of this experiment in city administration.

A UNIQUE WATER TOWER.

By Edward P. Bailey, Los Angeles, Cal.

AN interesting and unique construction was completed recently in Little Bear Valley, San Bernardino County, California, by Arthur S. Bent, a contractor of Los Angeles. This structure is a reinforced concrete tower, 185 feet high, 13 feet outside diameter with an inside diameter of 9 ft. to the 124 foot level, at which point it is enlarged to 10 feet 6 ins. thus giving a shell thickness of 2 feet and 1 foot 3 inches. The tower is topped with an ornamental two-story superstructure carrying the valve-stands and winch mechanism for raising and lowering valves and screens.



REINFORCEMENT AT BASE OF CONCRETE WATER TOWER.

The tower stands in the 880-acre reservoir of the Arrowhead Reservoir and Power Company, in the San Bernardino mountains, at an altitude of 6,000 feet and is connected with the portal of tunnel No. 1, which is the outlet of the reservoir.

It is therefore an outlet water tower, designed to control the water supply of the completed system which is to lead through a series of tunnels and conduits to the valley below.

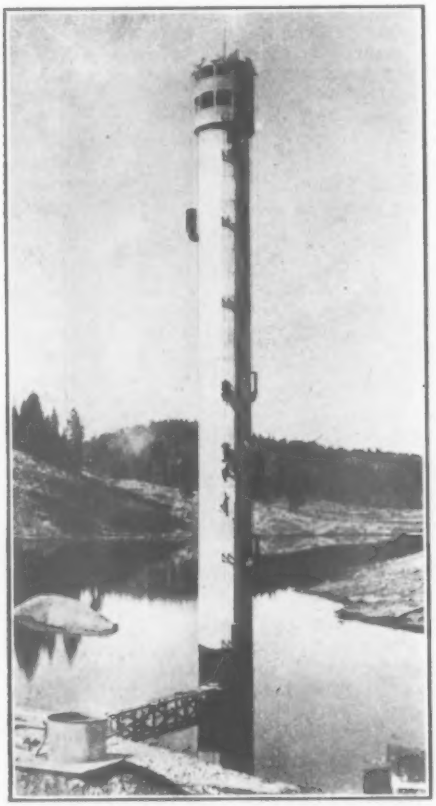
There are ten balanced 20-inch valves on the inside of the tower, each weighing about a ton; 3 of them sluice valves at the bottom of one level, and the other seven being spaced spirally at intervals of 20 feet up the tower. These valves are each fastened by 20 bronze stud bolts to a 22-in. cast-iron nipple which passes through the wall of the tower, and are controlled from the first floor of the superstructure by means of steel rods 1¼ inch in diameter, covered with brass tubing.

On the outside of the tower, elbows of cast iron are bolted to the nipples and on each elbow rests an iron screen 6 feet high and 3 feet in diameter, composed of vertical bars. These screens are raised and lowered by means of winch and chain operated from the second floor of the superstructure. The connections between the fittings are made water-tight by the use of white lead and corrugated copper gaskets. If a screen becomes choked with debris, the operator at the top closes that valve, relieving the water pressure, raises the screen to the surface of the water, removes the debris, reseats the screen and opens the valve again. This process suggests the necessity which resulted in the devising of this tower.

It had been planned to control the water by a gate in the tunnel operated through a shaft, a grizzly screen over the portal being provided to keep out

debris. But as the water rose in the lake the increasing pressure made it difficult and finally impossible to keep the screen clear and because of this and the advantage of being able to let in any stratum of water desired for domestic use, a tower was suggested.

When the lake is filled with water it will stand about 100 feet deep around the tower. To withstand this pressure at the bottom, special attention was paid the grading and cleanness of the aggregate, the sand being thoroughly washed and freed of mica and loam and the crushed stone being carefully selected. A very dense mixture was secured. In addition to this, the lower 30 feet of the tower was given a coat of 1-inch mortar trowelled to a smooth



REINFORCED CONCRETE WATER TOWER.

finish and upon this a coat of waterproof paint.

To secure a smooth and impervious face on the outside a steel form was used and great care was taken in tamping and spading. This form was raised by means of four 1-ton differential pulleys, which were fastened to channel iron heads supported by a scaffold carried up on the inside of the tower. This scaffold was kept 30 feet in advance of the concrete and was built with 6x6 posts and 2x6 ledgers to carry the heavy valves and fittings as they were hoisted into place. Not being able to make a continuous run of concrete, great care was taken to prevent percolation between joints of old and new work, the surface of the old concrete being roughed up with picks and a groove 2 inches deep by 3 inches wide made. Upon this was placed a mortar composed of 1 part cement to 2 of sand before the regular mixture was placed.

Cold, snow and windy weather were encountered, which at times made progress difficult. The thermometer sometimes registering 8 degrees above zero made recourse to steam necessary; to keep the concrete from freezing a steam line was carried up the inside of the tower and connected by means of a steam hose to a coil of perforated pipes upon the outside of the steel form. A canvas hood over all confined the steam and the temperature was kept at 60 to 70 on the coldest nights. The design of the superstructure necessitated the cutting and fitting of 2,800 pieces of lumber to measure. The first floor of the superstructure projected beyond the cylinder of the tower 14 inches by 14 inches thick and acted as a cantilever, carrying the entire weight of the second floor and roof upon a projection by means of ten columns spaced equal distances apart.

The foundation block, 30 feet square and 6½ feet thick, is heavily reinforced with 1-in. twisted steel and rests upon a solid rock bed. Upon this foundation block are two blocks, each 4 inches thick and of smaller size, one irregular in shape and one circular. Reinforcement of tower cylinder is deeply imbedded in these three blocks, making a very rigid structure, that when completed was found to sway but 1 inch in a high wind; and so accurately was the work carried up that when completed there was found to be at the top a variation from true vertical of less than ¼ inch.

This interesting structure is claimed to be the tallest concrete water tower in the world. It is certainly the highest. The engineers were F. C. Finkle, F. E. Trask and W. H. Brown. Mr. Geo. Smith of Los Angeles was superintendent in charge of construction.

THE HIGH PRESSURE WATER SUPPLY OF WINNIPEG, MAN.

FOR the past four years Winnipeg has been constructing and adding to its high pressure water plant, begun in 1905, and now has an efficient instrument for fighting fires, as has been demonstrated by several actual tests.

The original estimate of cost advertised on September 25th, 1905, was $560,000. An extension of the mains advertised on June 5th, 1908, has cost $23,000 more; again on August 23d, 1907, an additional $10,000, making a total of $593,000 on the three tenders advertised, which was considered sufficient for the installation and construction of the system. However, before the plant was half completed it was thought advisable to make alterations with the result that the total expenditure amounted to nearer $1,000,000 approximately.

The power house is a magnificent up-to-date station, 158 ft. by 92 ft. and is divided into two main bays. Two 20-ton overhead traveling cranes are supported by substantial columns which are also designed to support the roof. The cranes travel the full length of the building and are operated from the engine house floor.

The pumping plant consists of four units of 1,800 gallon per minute each, and two units of 900 gallons per minute each, water being taken from the Red River. The large mains are eight miles in length and are from eight inches to 20 in diameter. The fire hydrants number 86; pressure per square inch 300 lbs., and the total capacity, in gallons, per diem, 12,960,000.

The foregoing is exclusive of the city's domestic supply, which provides 1,224 fire hydrants with a pressure of 80 lbs. per sq. inch. The capacity of the artesian wells in service is 7,500,000 Imp. gals. per day. Another well almost completed will increase the daily capacity 2,500,000 gallons further. The present total capacity of pumps on the domestic system is 25,000,000 gallons, which can be further increased as required. The high pressure pumps with all connections were built by Messrs. Glenfield & Kennedy, Limited, Kilmarnock, Scotland, and were installed here under the supervision of Col. H. N. Ruttan, City Engineer and Mr. A. E. Myles, representative of the firm. The pumps are driven by gas engines which are located on the main floor eighteen feet below street level, each set standing complete by itself; the pumps being located in pockets twelve feet below main floor.

The ratio of gear is about 3½ to 1, and the pumps are of the three-throw vertical double acting piston type. The barrels are 13⅞ diameter by 18 in. stroke, while the speed is 35 revolutions per minute. The crank shaft is one mild steel forging, machined all over. The whole of the pump rests on a massive soleplate, bolted to the concrete by twelve heavy binding bolts. The two main suction pipes are 24 inches in diameter at the larger end and carried by H beams of steel grouted in the concrete. There are two suction wells 9 ft. square, divided by a concrete wall, and 40 feet deep from the street level. There are two 20-inch delivery mains in the engine house, and all the pumps are connected with these. Either can be isolated should a burst occur and water can be pumped into the other.

The gas engines are manufactured by Messrs. Crossley Bros., Manchester, England, all furnished with two single acting tandem cylinders, water-cooler pistons and rod, balancer, water-cooled exhaust valves, and duplicate low tension magnet ignition. The four large engines have cylinders 32 inches in diameter and 36-inch piston stroke, and 520 boiler horse-power when running at 125 revolutions per minute on producer gas. On test at Messrs. Crossley's works, the engines gave over 32 per cent. efficiency. The two smaller engines have cylinders 22 inches diameter and 30 inch piston stroke, giving 270 boiler horse power at 150 revolutions per minute on producer gas. Governing is on the "hit-and-miss" principle. All the engines are started with compressed air, stored in two receivers at 200 lbs. pressure.

The gas supply is furnished by a Crossley gas producer plant, rated at 50 per cent. overload capacity, while an alternative gas supply is taken from the city mains. Portions of this plant have been in operation since the Fall of 1907. The following test was made under the supervision of the City Engineer, Col. H. N. Ruttan, Chief Buchanan of the Fire Department, and the Board of Control. Eight lines of hose were used on one occasion 2½

inch nozzles attachments held in angular positions. The great streams of water reached high over a seven story building and were ejected with terrific force and volume. The first occasion for the use of the high pressure demonstrated very clearly the value of the new fire fighting machine. The length of the basement of the building where the fire occurred was 175 feet, and the seat of the fire originated near the centre, which burned fiercely. The nozzles of 2½ inch hose pipes were brought into operation and the conflagration was under control inside of fifteen minutes. This occurred in one of the most valuable business centers of Winnipeg, and had it not been for the existence of a high pressure plant, it might have attained to alarming proportions, involving tremendous loss.

The second active test occurred when a large jewelry establishment caught fire. On this occasion the high pressure system worked at a great disadvantage, through the inaccessible position of the premises, but managed to confine the damage by fire to the basement alone, and saved the building.

As a result of the existing comparative immunity from destruction through fire in Winnipeg of the business houses and factories, the various insurance companies have lowered their rates, which of itself speaks in unmistakable terms of the excellent system installed, and of its efficiency.

THE WATER FILTRATION PLANT AT ASHTABULA, O.

THIS plant is located between the high duty pumping plant and the lake of Ashtabula Harbor, and supplies the water for the City of Ashtabula.

The plant consists of two coagulating basins each 26 feet by 92 feet and 17 feet high, having a total capacity of two and one-half hours coagulation; eight filter beds each 14 feet by 20 feet 6 inches, having a total capacity of six million gallons in twenty-four hours; and a clear water reservoir 52 feet wide by 60 feet long by 14 feet deep which is located underneath the filter beds.

The machinery room is 52 feet by 41 feet by 18 feet and is located between the coagulating basins and the filters.

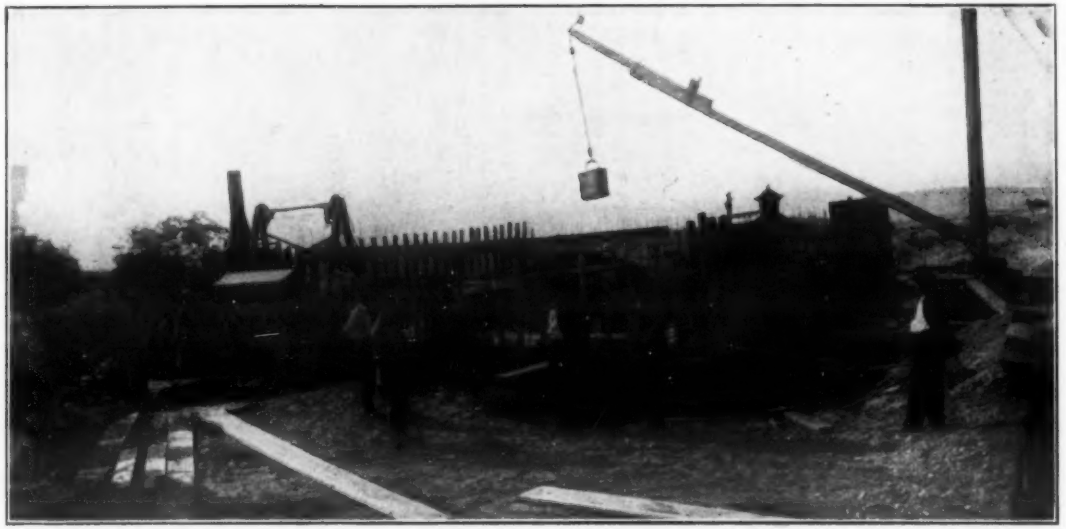
The pump well is 20 feet in diameter and the bottom is 7 feet below the lake level. The floor of the machinery room is 7 feet about the lake level.

The coagulating basins, filter beds, clear water reservoir, and tunnel over intake pipe underneath the coagulating basins, are all built of reinforced concrete. The foundations of the machinery room are built of reinforced concrete. The superstructure of the machinery room above elevation is of brick, also the superstructure over the filters is of brick. The roof trusses are steel.

The water is taken from the lake through a cast iron intake pipe from a crib located about 3500 feet from the filter plant. This pipe discharges into a well which is located in the machinery room. Over the pump well is a reinforced concrete floor and on this floor are located two six-million gallon centrifugal pumps, which pump the water from the well into the coagulating basins. The water passes through the coagulating basins and discharges into a forebay. From this forebay there is a 30-inch cast iron pipe that runs to a canal located over the clear water reservoir and between the filters. The water passes from the canal onto each filter bed through a specially constructed valve. In each filter bed there are thirty inches of specially prepared sand and nine inches of specially prepared gravel. Over the bottom of each filter bed is one of the Norwood Engineering Company's special manifold systems and an air wash system. The water passes through the sand into this manifold system and from the manifold system through a rate controller and discharges into the clear water reservoir located underneath the filters. Connection is made from this clear water reservoir to the high duty pumps in the station, which is located about 150 feet from the filter plant.

Sulphate of alumina is used for a coagulant, and is fed into the water in the suction pipes of the centrifugal pumps used for pumping the raw water to the coagulating basins.

There are two large tanks for dissolving the sulphate of alumina, and regulating boxes so that the exact amount of coagulant required is fed into the water. The amount of alum used varies from ¾ to 1½ grains, according to the turbidity of the water.



WATER FILTRATION PLANT FOR ASHTABULA. O.
I. Excavating for Clear Water Reservoir.

In the machinery room there is a laboratory for making bacteriological analysis of the water, also a storage for the sulphate of alumina, and a wash pump and air compressor for washing the filter beds. The filter beds have to be washed about every eighteen hours.

The plant is giving splendid efficiency, showing a bacteria removal of over 98 per cent.

There are no cracks in tne concrete nor any seepage.

The whole plant was erected in a very short time. The erection was commenced in August, 1908, and the plant was ready to run the first of January, 1909.

The Norwood Engineering Company says that they used considerable reinforcing steel and plenty of cement, about 2,200 barrels of Lehigh cement being used, and that as to water tightness and cracks they think the job is "the best ever." No waterproofing was used so that the fact that the concrete is waterproof is due to the use of a proper proportion of cement.

The work was done for the Ashtabula Water Company at Ashtabula Harbor, O., by R. P. Burnett & Co., the contractors for the substructure and the superstructure, and B. F. Hewitt was the engineer in charge of construction.

The photographs show the progress of the work.

QUALITY OF GAS.

By Alton D. Adams, Worcester, Mass.

SMALL savings in the expense of gas manufacture are suggested as the object of changes that largely increase the cost of light and heat to consumers.

These changes include the production of poorer gas and more gas per ton of coal carbonized, the failure to purify the gas of carbonic acid and sulphur, and the use of hydrocarbon vapors to increase the illuminating and heating power of this poor gas.

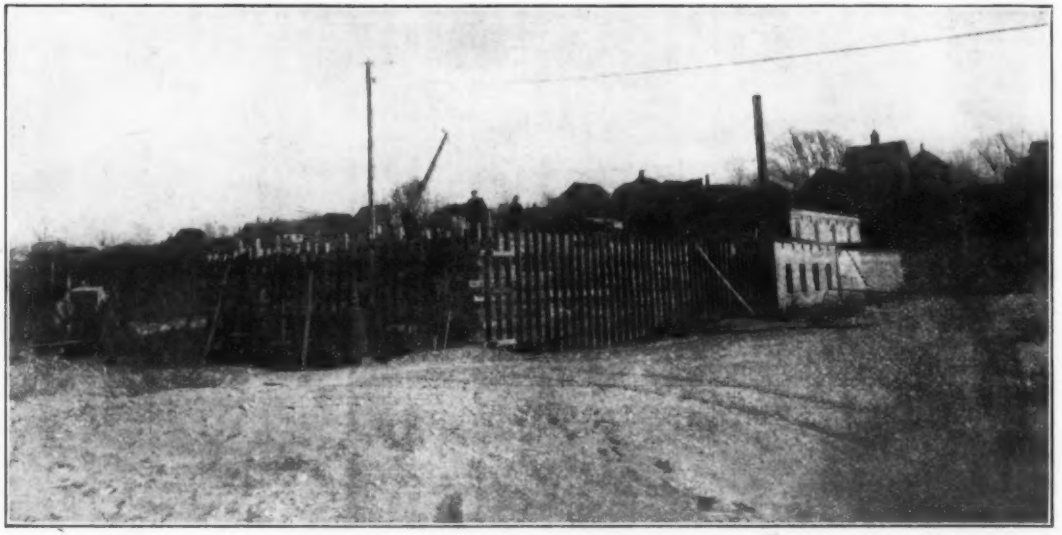
Gas sells for so much per thousand feet, but consumers really pay for light and heat and the changes just named reduce the lighting and heating power of the gas delivered to consumers. Besides this direct reduction in its money value, the poorer gas incident to large production per ton of coal often contains sulphur in amounts injurious to persons, books and furnishings where it is burned.

The inducement to gas companies for the production of lean gas containing high sulphur and enriched with the vapor of volatile hydrocarbons comes about as follow:

Good coal yields 9,000 to 10,000 cubic feet of 16-candle-power gas per ton, but by the employment of higher temperatures at the retorts the yield may be increased to 11,000 or 12,000 or more feet per ton, while the candle-power may sink as low as 12. The amount of sulphur in other forms than sulphuretted hydrogen in crude coal gas increases much faster than the yield of the gas per ton, due to higher retort temperatures, so that a large yield per ton often means an excessive amount of sulphur per unit volume of the gas.

This increase of sulphur with the larger yield of gas per ton of coal is illustrated by one set of experiments where a production of 9,431 feet of gas per ton showed 26.7 grains of sulphur other than sulphuretted hydrogen per 100 feet, while a production of 11,620 feet of gas per ton of the same coal gave 44.1 grains of such sulphur per 100 feet. Even these results are far outdone in practice, for the sulphur in the gas delivered to consumers by one of the London companies has been up to 78.5 grains per 100 feet, since the sulphur restriction was removed at the beginning of 1906, though the previous legal limits had been 17 grains in summer and 20 in winter, per 100 cubic feet.

By an increase of retort temperatures a gas company may thus get 1,000 or 2,000 feet more gas to sell from each ton of coal carbonized, though this increase of volume is accompanied by a more than corresponding decrease of illuminating power and by a large addition to the contained sulphur. If gas companies that have determined to run up the temperature of retorts and produce this low grade coal gas are in a jurisdiction where moderate limits are fixed for the sulphur in the gas delivered to consumers, as in Massachusetts where the limit is 20 grains per 100 feet, it is natural to move for the abol-



WATER FILTRATION PLANT FOR ASHTABULA, O.
II. Forms in Place for Concrete Walls of Reservoir and Basins.

ition of the sulphur restriction so as to save in the cost of production.

With the sulphur restrictions removed the tendency is to abandon entirely the use of lime for purification, but lime is the only substance that has proved to be generally effective in the purification of gas from sulphur other than sulphuretted hydrogen. A reason put forward for the removal of the sulphur restrictions and the disuse of lime is the alleged nuisance caused by the foul lime to parties living near the gas works, but when the lime is properly handled this nuisance is very slight and does not compare with the widespread injury to persons and property where gas containing a large amount of sulphur is used.

If lime purification is abandoned another impurity, carbonic acid, appears to depreciate the lighting and heating power of the gas. Where lime is used for the removal of the sulphur in the gas, the carbonic acid is quite sure to be taken out, as this acid has a greater chemical affinity for the lime than sulphur has. Coal gas that has not passed through lime often contains 2 to 2.5 per cent. by volume of carbonic acid, and water gas without lime purification may be expected to contain this acid to the extent of 4 or 5 per cent. As carbonic acid is simply the product of the complete combustion of carbon, it adds nothing to the lighting or heating power of the gas, though it is all recorded on the meters of consumers.

More than this, carbonic acid absorbs so much of the heat developed by the combustible parts of illuminating gas that 2.5 per cent. of this acid in coal gas causes a loss of 2 candle-power from what the gas would otherwise give at flat-flame burners. If the lean gas produced by the operation of retorts at high temperatures gives only 12 candle-power after its carbonic acid has been removed by purification with lime, this same gas may yield but 10 candle-power when its carbonic acid is retained.

The legal standard for gas is often fixed at 16 to 20 or more candle-power, but it is the custom and sometimes the law to test the gas at certain fixed testing stations that are often only moderate distances from the works. If the gas is up to the standard at these testing stations it is usually taken to be up to the requirements of the statute, no matter what the candle-power of the gas may be when it reaches the burners of consumers.

If the ordinary illuminating power of coal gas at the testing stations be taken as 18 candles, only two or three candle-power need be added by enrichment to good coal gas produced at the rate of 9,000 to 10,000 cubic feet per ton of coal in retorts at moderate temperatures, provided that lime purification is employed to remove the carbonic acid.

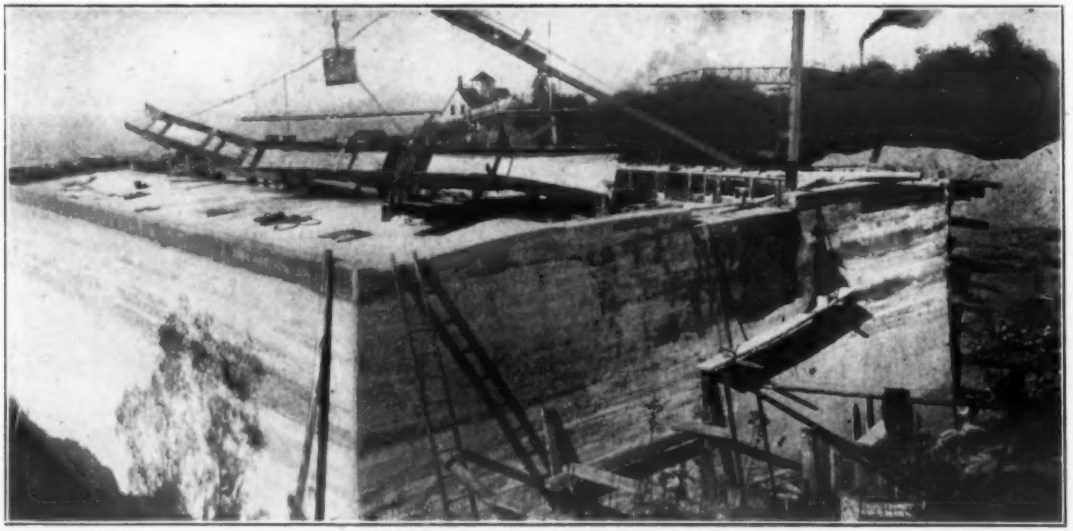
With high heats at the retorts, 11,000 to 12,000 or more feet of gas produced per ton of coal, and the carbonic acid left in the gas, it may be necessary to add six or eight candles to the gas by way of enrichment to obtain gas of 18 candle-power for distribution.

Coal gas may be enriched by mixing it with the gas of cannel coal, or by mixing it with oil gas, or by mixing it with the vapors of volatile hydrocarbons. The amount of these hydrocarbon vapors that coal gas will retain depends on its temperature, among other factors, and a gas so enriched may show a much lower candle-power at points one to several miles from the works than that found at the testing stations, due in part to the fall of temperature in the long mains. Such results may well be expected under conditions like those in Massachusetts, where the statute provides for a testing room at least *a quarter of a mile* from the gas works, for the state inspector.

If a method of manufacture is adopted that produces a gas high in sulphur and carbonic acid impurities, and that requires some six candles of enrichment, more or less, consumers are apt to suffer heavy loss where this enrichment is made with the vapors of volatile hydrocarbons. This loss is no mere supposition, for it is a part of the official records as to one of the London gas companies, that while its gas gave more than 16 candle-power at the testing stations it gave only 11 and 12 candle-power at various other points in the area of supply.

Any such loss of candle-power carries with it a large loss of heating power, and bears heavily on consumer.

If 16 candle gas sells for 80 cents, or 18 candle gas for 90 cents, or 20 candle gas for one dollar per thousand feet, the cost to the consumer in each case is five cents per candle power. When the gas drops four or five candle-power between the testing station and the burners, due to the condensation of volatile hydrocarbon vapors used for its enrichment, the loss to consumers at above rates is evidently 20 to 25 cents per thousand feet. Of this loss the company gains a fraction by sending out gas that contains high sulphur and carbonic acid impurity and by using a cheap vapor enricher.



WATER FILTRATION PLANT FOR ASHTABULA, O.
III. Reinforced Concrete Wall and Roof Over Coagulating Basins.

In Boston, during the fiscal year of 1907, the gas sales of a single company yielded $3,366,125.41 gross, and the gas had an average of 18.6 candle-power, so that the price received on the total volume of sales was $181,000 per candle-power. On this basis, the loss of four candle-power between the testing stations and the burners would have cost the consumers of this one company $724,000 for the year.

With present tendencies in gas manufacture, it is necessary for the protection of consumers that gas be purified of carbonic acid, and that tests for candle-power be made with portable photometers on the outlying parts of the gas distribution system.

About 1900, in London, the gas companies were below the 16 candle standard as tested by the portable photometer, but when a bill was brought into Parliament to make the use of the portable photometer the legal method of testing, the gas of two of the companies rose two candles in illuminating power.

GROWTH OF THE SEWAGE DISPOSAL IDEA.

The Dilution Method.

By Alexander Potter, Consulting Engineer, New York City.

THE following is the introduction to an address delivered by Mr. Alexander Potter, C. E., before the Board of Trade and the Commercial Club of Indianapolis. He describes the dilution method heretofore in use in this country and shows by comparison with English conditions the limitations of this method. Other parts of the address will be published later, showing the various methods of sewage treatment which have been the subject of experiment and their relations to American conditions so far as they have been determined.

The growth of the sewage disposal movement in America cannot be well disputed. The present popularity of the movement is due to a number of converging causes. More recently, perhaps, the activity of some of the most prominent men of the country, in bringing the discussion of more sanitary conditions before the people, is in large measure, responsible. The rapid increase of population in our cities and towns and the pollution of water supplies are, without doubt, the basic causes. Advance in sanitary science and the evolving of a plan of sewage disposal at a comparatively recent date fitted to average American conditions is creating confidence in the public mind that the early failures of the experimental stages of the science need no longer be repeated. Consequently, there is a growing demand for the restoring of our streams to their natural purity and for the disposal of our city wastes on the most approved sanitary lines.

Sanitary engineers have learned from the failure of the pioneers in the work that no single system is fitted to the needs of all cities and that each community should select, with the aid of careful and expert advice, just that method of sewage disposal which is best fitted to its needs and conditions. In the midst of the pressure which is now brought to bear upon cities regarding sanitary matters, it is most vital that each community should carefully consider all aspects of their situation, and not be forced into expenditures in excess of their needs and obligations.

The collection and disposal of sewage and storm water is a most important problem, but it cannot be discussed wholly upon a financial basis, since the real remuneration accruing from such systems is in proportion as the health of the community is improved, healthfulness of surroundings and cleanliness of habits encouraged, and agreeable conditions of life established. Finances do, however, enter largely into the consideration of the question, both pro and con. Every life saved, every man, woman and child made more healthy and hence more capable of fulfilling his duties and activities in life, is a monetary gain to the community—but such returns are difficult to compute in dollars and cents. I believe, however, that we have reached a state in modern civilization and altruistic thought where the conviction that "life under right conditions is worth the living," and that "what we do for the general good we do for ourselves," lifts us upon a plane where we can take a broader

WATER FILTRATION PLANT FOR ASHTABULA, O.
IV. Brick House for Operating Plant and Storage Over Concrete Substructure.

outlook upon life than merely net returns in dollars and cents. If this were not so, America would not be to-day the land of the most comfortable homes, the most cleanly cities and the most moral communities that the world has ever seen. Still, I have not reached the point where I believe a community should be forced into the most expensive system or the extremest degrees of sewage purification without having the right to inquire into the cost and the real necessities of the situation.

In order to obtain an idea of the growth of this science and of methods which still obtain in the practice under varying conditions, we will find it profitable to visit the home of sanitary science on the other side of the waters and briefly consider the conditions which made it necessary for England and Continental cities to work out the problem in its earliest stages.

In a lecture recently delivered by W. T. Sedgwick of Boston, he pointed out how very unsanitary were the conditions existing in England in the thirteenth century. Bathing was rare and sanitation was not thought of. Dirt prevailed everywhere, breeding smallpox, typhus fever and all kinds of malignant skin diseases. Even as late as Shakespeare's time filth still reigned supreme, and the odors from the Fleet ditch, that flowed through London, were so powerful that they overcame the perfumes of the incense burned in the churches near its banks. There was no ventilation in the houses, fresh air was considered dangerous to health by most people, and the death rate was 1 in 23. Not until after the Great Plague and the Fire of London in Charles II's time, were officers appointed to look after the public health and welfare. These were the first health officials to be appointed, but they did not remain long in office. Even as late as the nineteenth century conditions were very bad and life very hard. Children were sold like slaves and worked sixteen hours a day in the mills, including Sundays. No anti-child labor organixations in those days, you see! Morals were bad, as well as health, for tea was $5.00 a pound and whisky only 20 cents a quart. No prohibition wave had struck England in the nineteenth century. Bread was a luxury. But these were the "good old times" when there were no health officers and none of those precautions to stamp out disease which municipal governments take to-day.

After such a description, no one will dispute that the world is advancing. Such a condition could not go on even in "Merry Old England," and to-day she stands as the example and pattern of all things sanitary, and to her we have turned for most that is best and latest in sanitary science.

About the middle of the nineteenth century, we hear of public sewers being constructed to empty directly into the nearest water courses, and thus we see that dilution was the earliest method of sewage disposal. This is still the method most used in America, and is considered satisfactory as long as the relation between the amount of sewage and the flow of the stream remain within proper limits. Generally speaking this limit is about 200 cu. ft. per minute of river water for every 1,000 persons contributing to the sewer, but does not guarantee immunity to the town below drawing its water supply from the river.

This limit of dilution was soon exceeded in most English cities and it became necessary to devise other means of purification before emptying the sewage into the small streams. As our subject develops you will see, however, that the standards of purification vary largely in different places. The sewage of the City of London, for instance, amounting to 280,000,000 gallons a day, is first passed through settling tanks, where it is treated chemically and then discharged into the River Thames, from which nearly the entire normal flow is abstracted above the city to supply London with water. As the water shed of the Thames is only about 4,500 sq. miles, the dilution effected by the river upon the sewage is very slight during dry weather, and the river consists below the city largely of the chemically treated sewage flow. According to the comparatively recent report of the County Council of London, the yearly flow of the sewage of London was 105,067 million gallons and represents a canal 24 ft. wide, 9 ft. deep running 2 ft. per second. But London has the influence of tides in the river and this partly offsets the small dilution.

The cities of Manchester and Birmingham have no counterpart in this country. The City of Manchester drains its sewage effluent into the Manchester Ship Canal. The flow of this canal is so small that the lockage water has to be pumped back into the upper level of the canal each time a boat passes down through the lock. At Birmingham the sewage effluent

constitutes about one-half of the total flow of the stream into which it is discharged.

The greater size of streams in America has given us a somewhat longer lease of the use of the dilution method of disposal than could be had in England, as there is scarcely a city of any size in America that is not situated on a river or lake of greater magnitude than those of England. The relation between the stream flow and the sewage flow therefore is such a potent factor in purification that the facts recited about English conditions not only show the grave necessities of developing further purification methods in England, but also serve as a basis of difference between the problems which are confronting us and those which have been dealt with in England. So that, while we have thus far had largely to go to England for the best methods of sewage disposal so far developed, I believe that new lines of application of those methods will have to be worked out by the American sanitarian before the best results and the wisest economies will be reached in this country. English practice offers us many methods with which to solve our problem, but her achievements have not solved American problems.

To make this difference clearer, let us compare the size of some of the rivers in England, and their ability to absorb the sewage or the sewage effluent, with some of our well known streams along whose banks are very prosperous towns.

The Ohio River at its beginning at Pittsburg has a water-shed of 18,735 miles, as opposed to the Thames 4,500. Of this water-shed, 11,107 sq. miles belong to the Allegheny and 7,625 sq. miles to the Monongehela water-shed.

The Miami River has a water-shed of 5,400 sq. miles.

The Mississippi has reached the size of the Thames while still 300 miles above the City of St. Paul. Even the Minnesota River where it joins the Mississippi at St. Paul is nearly four times the size of the Thames.

The Illinois River has a water-shed of 29,013 sq. miles, and the Des Moines of 14,378 sq. miles—over three times the size of the Thames. Even your little White River at Indianapolis has nearly half the water-shed of the Thames at London, and the Thames is the largest river in England.

It is easy to see, therefore, how quickly the populous cities of England were forced to discover other methods of disposal and purification, which they have worked out through years of experiment and vast expenditure.

GOOD CONCRETE AND HOW TO GET IT.*

By Frank M. Okey, Engineering Experiment Station, Ames, Iowa.

IT goes without question that to obtain good concrete, good Portland cement must be used. I heard a contractor make the statement not long ago that the manufacturers of cement were reaching so high a standard nowadays, and their product was running so uniform, that it was almost a waste of time to have a shipment sampled and tested. I am sure that the manufacturers will appreciate this compliment, but nevertheless we must not think for an instant that vigilant inspection should be relaxed, nor that we should fail to have even a single car of any shipment tested. There is always chance of a slip, and that slip may prove highly expensive. Facilities for cement testing are available nearly everywhere, and the cost of the tests is not a penny compared to the damage resulting from a single car of bad cement. However, it is seldom that a sample fails to pass the requirements.

The specifications of the American Society of Civil Engineers are made lenient enough that a cement failing to pass them ought to be rejected. Many cements pass above even the highest limit required in tensile strength. This statement is based on the results of about forty tests made on twelve or fourteen different brands of Portland cement during the last year. More than sixty per cent. passed the higher limit for tensile strength and only three samples failed to pass at all.

So I am firm in my stand that all cement used should be subjected to all the tests required by the American Society specifications, and it is up to the contractor to have the cement on hand

*From a paper before the Iowa Cement Users' Association.

long enough for complete tests to be made, which means not less than 30 days.

Mr. W. A. Aiken, of the Spackman Engineering Co. of Philadelphia, makes the following statements: "The place to inspect cement, and incidentally to test it, is at the point of manufacture, and not after the material has been delivered on the work, where, even if condemned on test, and tests alone without intimate acquaintance with the product mean less than generally thought, it is a difficult and expensive operation to prevent its possible use, either through the instance of the manufacturers' agent or the demands of construction . . . The necessity for inspection in no way reflects on the manufacturer, since intelligent inspection is valuable to both producer and consumer, and must of necessity result in raising the quality of the product, no matter what the material. While the percentage of cement rejected through inspection is not large, as a rule, taking the whole volume of the industry into account, every one engaged in using this material should realize the value of inspection and appreciate that the discovery of and prevention of the use of even a small per cent. gives the purchaser an assurance of quality that can be accomplished in no other way."

But to make concrete an aggregate is necessary; sand and a coarser material, usually gravel or broken stone, and occasionally, when a concrete of lighter weight is desired, cinders.

The important part sand plays in concrete work is not generally recognized, and even among contractors and engineers who have at some time experienced trouble directly traceable to the sand used, there is found the tendency to depend too much at times on a superficial examination. It is certainly marvelous to observe what wonderful binding qualities cement has when it is mixed in the proportion of one to three of sand and five or six of stone. But we must note, however, that the cement must be spread out pretty thin to fill the interstices of the sand and coat the surfaces of the individual grains three times in volume the cement used. If the sand, however, be poor by reason of its geological origin, mineral composition or decomposition, or because of excessive fineness or its content of fine material of a non-silicious nature, then it is useless to expect good results of such proportions as 3 sand to 1 of cement, and only careful analysis and test of the sand will enable us to judge as to whether it should be used at all, and, if so, in what proportions to attain the desired results within the required working limits of seven or twenty-eight days.

Sand should be clean and coarse, and the individual grains should be firm. If the grains are covered with a thin film of dirt or clay, the cement cannot get a bond and when concrete made with such sand is broken, the fracture shows that the grains pull out of the cement and leave little pits lined with a film of clay. Undoubtedly, such concrete is weak. I know I am treading on dangerous ground when I say that clay in sand is a detriment, for many tests have shown that sand that contained a considerable percentage of clay and loam developed a higher strength than sand that was clean. But I believe as a usual thing clean sand is the safer. In a recent piece of concrete construction, it was found, when removing the forms from a column, that between the batches of concrete there was a thin layer of what proved to be clay. The sand used contained quite a percentage of this substance, and in tamping the concrete, which was quite wet, the clay had come to the top and formed a layer of appreciable thickness. The column was of course torn out and rebuilt. Further, if the grains are weak individually, and easily fractured, such a sand should be discarded as dangerous.

Coarse sands give a stronger concrete than fine. Tests made by Peret, a Frenchman, showed that in mixtures of 1 cement to 2½ sand the coarse sand developed a strength of 421 lbs. per sq. in. in five months, medium sand 368 lbs. and fine 300 lbs. Crushing strength was more marked, showing 5,200 lbs. per sq. in. for coarse, 3,400 lbs. for medium and 1,900 lbs. for fine.

The best sand is that which is so graded that the voids are at a minimum, or according to Mr. Peret, where the proportion of coarse grains to fine is two to one. One of our eminent authorities on concrete, Mr. Sanford E. Thompson, says that sharpness is not an essential characteristic of sand. He says: "The majority of specifications still call for 'sharp' sand, and yet I have never known a sand to be rejected because of its lack of sharpness. As a matter of fact, if two sands have the same sized grains, and contain an equal amount of dust, the one with rounded grains is apt to give a denser and stronger mortar than the sharp grained sand. A sand with a sharp 'feel' is preferable to another, not to any extent because of its sharpness, but because the grittiness indicates a

silicious sand which is apt to have no excess of fine material."

Much care should be taken in the use of gravel. In some of the gravel used for concrete, many of the pebbles are of very soft composition and easily broken, and some in fact can be crumbled between the fingers, while not a few which seem quite hard are only shells surrounding very soft interiors. Concrete made with gravel of this kind is weaker than it appears, for every poor pebble reduces the area of the member by an area equal to its own cross-section. That the individual pebbles should be clean goes without saying, for cement cannot gain a good hold on a surface that has a coat of clay or loam, however thin, and when the strain comes, the pebbles pull out, leaving pockets lined with a film of the dirt.

The hardness of the stone used, the shape of the particles, their maximum and relative size, materially affect the resulting concrete. I refer now to broken stone. When there is opportunity for choice, the best is that which is hard, with cubical fracture, and with particles whose size is as large as can be handled in the work. Crushed limestone is most used as the coarser aggregate in this part of the country, and Thompson rates it fifth in his scale of values of aggregates, which is as follows: Trap rock 1st, Granite 2nd, Gravel 3d, Marble, 4th, Limestone 5th, Slag, 6th, Sandstone 7th, Slate 8th, Shale 9th, and Cinders 10th. Mr. Thompson gives this classification as the result of a large number of tests, which showed that the hardest stone produced the hardest concrete. He says further that the hardness of the stone grows in importance with the age of the concrete. Thus gravel concrete, because of the rounded surfaces, at the age of one month may be weaker than a concrete made with comparatively soft broken stone, but at the age of one year it may surpass in strength the broken stone concrete because as the cement becomes hard, there is a greater tendency for the stones themselves to shear through, and the hardness of the gravel stones thus comes into play. This would certainly be equally true of the harder broken stones. It is best to avoid the use of a stone that breaks into flat pieces, for such material packs less closely and is generally inferior to stone of cubical fracture.

Of cinders, I have little to say, other than that they should be free from partially burned coal and fine ashes. Thompson rates them as the poorest material for an aggregate, and I believe their use should be undertaken with much caution.

However, while many failures of concrete structures are directly traceable to faults in the materials used, by far the greater number are due to poor workmanship and poor design. A certain man, who by the way is hardly to be classed as a friend of concrete, contorts Punch's famous advice to apply to concrete construction, thus: "Building with concrete, whether reinforced or not, is an undertaking not to be attempted rashly, but prayerfully, and the petition of salvation should never be so intent as when centers are about to be struck."

There is scarcely a field of building operations in which at first glance it seems simpler for the relatively inexperienced to do satisfactory work than in the use of concrete. Here are simple materials, sand, gravel and cement, mixed by crude labor, usually handled in a crude way, and not infrequently the results are equally as crude. I have seen and so have you, many a man posing as a concrete contractor who has no more business in that line of work than a brick mason at a jeweler's bench. It is greatly to be regretted that it is a popular idea that a very low grade of labor may be employed in mixing and placing concrete, and it is equally regrettable that this idea is carried out in practice. While it is true that the greater amount of the hard work necessary in concrete construction can be performed by men relatively inexperienced and unlearned in this occupation, the engineer and inspector should insist that the contractor place over them a foreman who thoroughly understands the principles of mixing and placing. Not only must the foreman be capable, but he must be honest, and I am sure you will agree with me that it is materially to the contractor's advantage to have a man of that kind in direct charge of work. I do not wish to be understood to say that the majority of foremen are dishonest, but I have seen men in charge of construction, who, the minute the inspector's back was turned, began scamping. A little of the cement was left out or an addition was made to the aggregate; reinforcement was carelessly spaced or wrongly set; sawdust and chips were left in the forms and dirt was shoveled up with the sand and rock. It is not necessary to further enumerate these things, for many of you are more familiar with them than I, but more than one failure has been directly traced to the scamping of the

foreman who did it, thinking, not only that he was "slipping one over" on the inspector, but that he was saving money for the contractor who employed him. The sooner the minds of such foremen are disabused of these mistaken ideas, the better it will be, not only for the contractor, but the concrete industry in general.

While, however, the contractor is held directly responsible for failure, it is highly desirable that the engineers who have in charge the execution of the designer's plans, be most efficiently schooled in the business, and should know for a certainty what to allow and what not to allow in construction, for the very flexibility and facility for rapid working of concrete invite disaster, if even the most responsible designs and installations be placed in inexperienced hands.

THE STEAM SHOVEL IN LOUISVILLE SEWER CONSTRUCTION.

By Frank C. Perkins, Buffalo, N. Y.

IN the city of Louisville, Ky., there is a most extensive system of sewer work under way, the outfall or main receiving sections being about five miles in length, and consisting of reinforced concrete having an inside diameter of seventeen feet.

It is stated that the cost of this sewer system for Louisville will be about $4,000,000. The accompanying illustration shows a steam shovel at work on a trench having a width of 20 feet and a depth of 12 feet. The outfall is constructed by various contractors, in sections of one mile, requiring excavating of trenches to a depth of 35 feet and a width of 20 feet, in which the reinforced concrete sewer is constructed.

STEAM SHOVEL ON SEWER TRENCH.

The first 12 feet of the trench is taken out by a steam shovel arranged especially for trench work with a long dipper handle. It is stated that the material is a rather stiff, sandy clay and when excavated by the steam shovel, is loaded into wagons on the bank and hauled away and used for filling some of the low lands in the neighborhood. This material all has to be wasted because of the fact that it is not needed for the back fill, as the sewer is of such size as to make the material in the remaining 23 feet of trench all that is necessary for that purpose.

The remaining 23 feet of trench is excavated by hand and loaded into buckets. It is then hauled back by a cable-way and used for the back-fill after the concrete has been laid.

As soon as the shovel excavates the

material, the trench is sheeted with planks and braced top and bottom. Following the shovel, and preceding the bucket gang, is a special sheet piling pile driver which drives steel sheet piling at each side of the trench to the depth of 35 feet. This piling holds the bank up while the trench is being excavated by the bucket gang. Driving the steel sheet piling after the first 12 feet has been taken out by the steam shovel, eliminates the expense of driving through 12 feet of stiff sand and clay and results in a considerable saving to the contractors. The system ends in a tunnel 17 feet in diameter and about 50 feet below the surface of the ground, to the point where it empties into the Ohio river.

A steam shovel of 32-tons size has been considered to have reached a maximum width when it has dug a trench 10 feet wide, but in this sewer work the shovel is digging a trench 12 feet deep and 20 feet wide. In fact the top of the trench is a little more than 20 feet wide, as it has to be 20 feet at the bottom, and a slight slope makes it nearly 22 wide on top.

The steam shovel used is of the regular Little Giant trench shovel type, fitted with a special high crane which admits of an extra high dump. The dipper handle is of wood and is 30 feet in length. The dipper is also of special design, having a flaring mouthpiece which makes the cutting edge the widest part. The bail is fastened to the inside and does not in any way interfere with the cutting action of the dipper. The machine as will be seen from the accompanying illustration is removed from its wheels and mounted on a timber frame which operates over rollers on each side of the trench.

THE COLLEGE AVENUE SEWER, INDIANAPOLIS, IND.

By De Witt V. Moore, Contractor.

THE city of Indianapolis during the past two years has been extending the city sewer system very rapidly. This not only includes local sewers in connection with main sewers already constructed, but also includes a number of new main sewers and branches, taking care of new territory. Among these new sewers, the College Avenue sewer is one of the larger and is especially interesting because of the varied character of the work.

The name given this job, the "College Avenue Sewer" is somewhat misleading, as only a comparatively small amount of the work is in such Avenue.

The work begins with the main sewer along the north bank of Fall Creek extending in a southwesterly direction from College Avenue to Central Avenue. This main sewer is a 6-foot internal diameter concrete sewer and branching off from same are three branches, running north in Ruckle Street, Park Avenue and Broadway, an average distance of 3810 feet. These branches in all cases begin with 3-foot internal diameter concrete sewers and reduce to 20-inch pipe.

The main sewer mentioned along the north bank of the Creek acts as a part overflow for storm water for the branches mentioned and at the lower end is connected by an intercepting sanitary sewer to the existing sanitary sewer system.

At the College Avenue end of this larger sewer, the sewer continues in College Avenue of a 3-foot internal diameter concrete construction for a distance of 2325 feet. From this point it continues in College Avenue as a 6-foot internal diameter concrete sewer and at this junction point between the 3-foot and the 6-foot sections there is an additional overflow running to the Creek, 400 feet in length, of 5-foot internal concrete construction.

The 6-foot sewer in College Avenue, just mentioned, extends to 38th Street, where the sewer makes a right-angular turn and continues west in 38th Street. Beginning in 38th Street, at College Avenue, the sewer is 8 feet internal diameter concrete and gradually reduces to 5 feet, 4 feet, 3 feet 3 inches and 3 feet concrete and finally to a 24-inch pipe. The length of this line in 38th Street is 7,325 feet.

From this 38th Street main line, there are several branches as follows: In Kenwood Ave., Capitol Ave., and Graceland Ave., pipe sewer extending north 1,285 feet of 18 and 20-inch pipe. In Meridian Street, extending north, a pipe sewer beginning with 20-inch pipe and reducing to 15-inch pipe of a total length of 3200 feet. In Washington

Boulevard extending south 1390 feet of 18 and 12-inch pipe. In Central Avenue extending south, 15 and 12-inch pipe of a total length of 690 feet.

At the junction of the College Avenue and 38th Street sewers, provision is made for a future overflow to extend easterly to Fall Creek. This overflow, however, will not be built under this contract.

Thirty-eighth Street is located on high ground, and just south of the street this ground breaks away and the majority of the College Avenue work and all the work first mentioned lies in the low ground, along the north and west bank of Fall Creek. This ground is liable to overflow in times of flood.

The depth of excavation on this lower portion in the bottom land ranged from 8 to 13 feet, the character of work consisting of a few feet of overlying soil, and then gravel and sand. On account of the dry season, practically no water was encountered in this work, except on the 6-foot section in College Avenue.

On the 38th Street work and the branches connected therewith, the excavation is much deeper, ranging from 24 feet as a maximum to 12 feet as a minimum, with the heavier part of the work in the deeper cuts. The overlying soil is a somewhat tougher clay that is encountered at the bottom, but gravel and sand is invariably found in the lower part of the excavation.

The total length of the sewer is made up as follows:

8 ft. concrete	1,325 ft.
6 ft. concrete	6,530 ft.
5 ft. concrete	1,790 ft.
4 ft. concrete	1,335 ft.
3 ft. 3 in. concrete	1,005 ft.
3 ft. concrete	5,965 ft.
2 ft. 6 in. concrete	4,035 ft.
24 in. pipe	850 ft.
20 in. pipe	6,485 ft.
18 in. pipe	4,605 ft.
15 in. pipe	945 ft.
12 in. pipe	1,045 ft.
Total sewer	35,915 ft.
House connections, 6 in. pipe	18,805 ft.
Laterals of various sizes from 6 ft. concrete to 10 in. pipe at street intersections	992 ft.
Total	55,712 ft.

In the total length of sewer listed above there are required 144 catch basins and 12-inch pipe connections, 93 manholes, 41 inlets and 12-inch pipe connections, 2 outfalls and sluice gates.

The work itemized above contains approximately 101,646 cu. yds. of excavation of all kinds and 9,059 cu. yds. of concrete. In the concrete, however, is not included the concrete catch basins and concrete manholes which would add approximately 600 or 700 cu. yds.

On account of the comparatively shallow excavation in the bottom land, nearly all the excavation was made by hand. The quantity of work to be done per lin. ft. of sewer was not large enough to justify the use of any machinery, and in addition hand work was desired because of the throwing to one side of the sewer of the surplus in the way of top soil and the throwing to the other side of the gravel and sand to be used for concrete and backfill.

Because of this supply of gravel and sand in excavation, concrete mixers of a small character were used, which were carried forward as the work progressed.

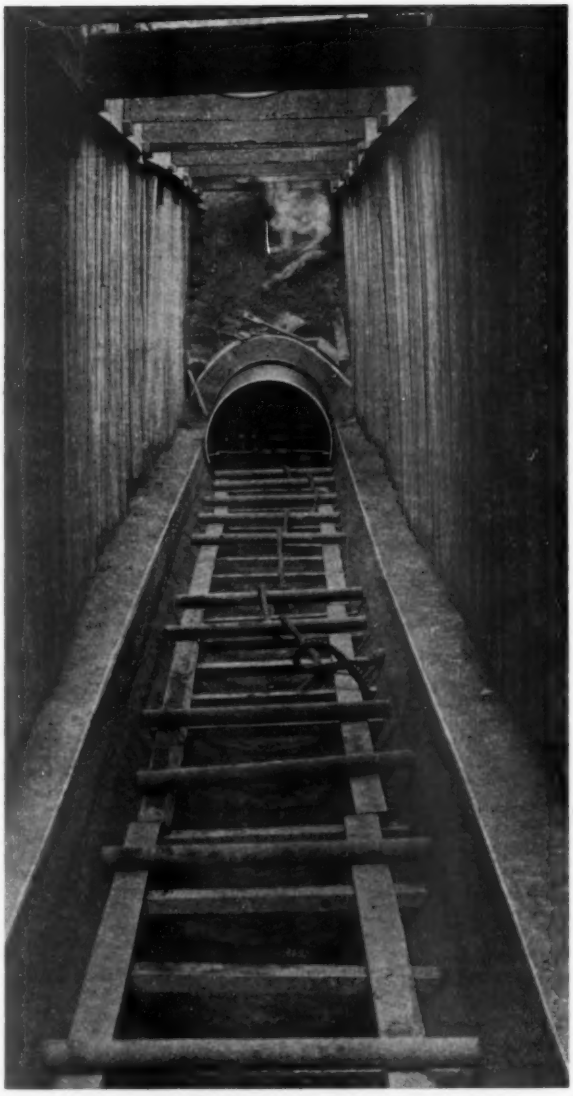
A No. 1 Smith steam concrete mixer mounted on trucks; a No. 7 McKelvey batch steam mixer, mounted on trucks, and a No. 4 Drake continuous steam mixer were used. The Smith and McKelvey mixers were pulled along the side of the trench, while the Drake mixer was carried directly over the work on steel rails. There was not enough difference in the cost or quality of the work with any one of these three types of mixers or methods employed to arouse any special interest or recommendation. On the College Avenue 6-foot section, a Channon revolving excavator with Page & Schnable bucket was used to remove the bulk of the excavation. The size and cost of this machine was entirely out of proportion to the amount of work to be done, but inasmuch as the machine was on hand and not busy on any other work, it was considered advisable to secure the advantage of machine work.

On the 38th Street line, the well known Potter sewer machine was used in connection with the batch type of concrete mixer.

In all of the concrete work, the Blaw type of collapsible centers have been used and found to be efficient and economical.

Fig. 1 shows very clearly a section of trench, completed concrete sewer and centers, method of moving same on the 3 ft. section of concrete sewer in the bottom-land work.

Fig. 2 shows the main sewer along the bank of Fall Creek first mentioned. This view shows more clearly the shallow excavation, the concrete work and the centers. This sewer as mentioned



COLLEGE AVENUE SEWER, INDIANAPOLIS, IND.

I. Completed Invert and Completed Arch with Center Ready to Move.

before, is practically on the bank of Fall Creek.

Fig. 3 shows the same work at the same point, a little more in detail, at the time when the centers are being moved for the building of a new section of crown of sewer.

Fig. 4 shows the same work at the same point and shows the centers being assembled to proceed with the construction of a new invert.

The illustrations shown are from photographs taken during the early progress of the work and really before the men became expert in the moving and use of the centers. After a few weeks, however, the men became so accustomed to the centers and the manner of handling same that the work proceeded at a great deal better speed.

In the construction of the concrete work, Lehigh Portland cement was used exclusively. In work of this kind, it is important that cement be of a standard grade and thoroughly reliable. The contracting company's experience with the uniform character and good quality of this cement has been entirely satisfactory and there has not been a single case of trouble on account of bad cement or bad concrete.

The engineering department of the city of Indianapolis should be commended for the efficient design, not only for this sewer, but for all the Indianapolis sewers, and they should receive a large part of the credit for the success of this work.

The work was begun practically the first of August, 1908, but because of moving in and getting started, the real progress began about August 15th. The low bottom work was started first and rushed with the idea of completing before floods, which are the probability in the fall of the year. On account of the extreme dry season, however, no trouble was experienced in this respect and on December 31st all of this bottom work had been completed and the work as a whole had reached a point where slightly over 51 per cent. was finished. The entire work will be completed this summer.

METHODS OF SEWER CONSTRUCTION IN CLINTON, IOWA.*

By Charles P. Chase, City Engineer.

THE largest piece of construction according to the sewer plans for Clinton, Iowa, described in previous articles, has been in District No. 4.

A contract was let in the fall of 1905 for about four miles of the mains in this district along the lines of the old water courses. Actual work began in December, 1905, and continued to April 1908, when the last pipe was laid. The contractors carried on the work, winter and summer, rain or shine, night and day for 801 days out of 820, never closing down the work but one day, which was in respect to a deceased relative. But it was a job where you could not stop. Water, mud, quicksand and rock was the program, the Mississippi River came up the second month and had to be kept out for over a year, a bulkhead being constructed and the water pumped over with a centrifugal pump. In addition to this there were innumerable springs and several miles of house sewers emptying into the old drain that had to be taken care of. Nearly all the work was sheeted, and out of 23,000 feet there was but 1,000 feet of dry work and that on smaller side lines. At one time two centrifugal pumps, three steam siphons, four diaphragm pumps and numerous buckets were at work in a 400-foot length of trench for a month before it was drained. The average depth of trench was twelve feet and water was generally found at two feet. Most of the water came through gravel or the seams in the rock and was shut off by draining the gravel below grade or in the rock at times by actually caulking with cement sacks. Small amounts were shut off with dry concrete, or the various other devices known to the trade.

Steel Forms: The first block of ten-foot sections was put in with wooden forms. After this steel forms were used with much better results. These steel forms are a great advance for good construction and, the writer holds are as much ahead of wood as the modern breech-loading gun is ahead of the muzzle-loader of our fathers. The steel

*From a paper before the Iowa Society of Engineers.

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II. Shallow Trench, Showing Stages of Work.

form is quickly placed, can be taken down in a few minutes, leaves smooth, hard, glossy work and is the only form for cold weather, as it radiates heat applied and keeps the concrete warm. Forms were greased every time they were used. After this experience I do not want any other forms for either brick or concrete. In the large sections, particularly the arch shapes, the concrete sewers were a great success, and I believe were better adapted to the adverse conditions than any form we could have used, especially in the winter work. But in the small work I would advice vitrified brick for the invert; in fact, use a vitrified brick for inverts in all small work (below four feet) where there are water or existing sewers to contend with. As to concrete in general, the writer never discovered any gray hairs before this work, but there were plenty when the job was finished.

Concreting in freezing weather was carried on without difficulty and successfully. Many methods were tried to heat the gravel used as an aggregate and finally the method of a steam jet was found best, the steam pipe being thrust into the pile. This wet heat gave excellent results. The water was warm and salt was used when the temperature was below 10 degrees above zero. As soon as the concrete was in place it was covered with manure or canvas, sometimes both, and coke heaters kept going all the time inside. I made up a set of instructions which were issued to my assistants and inspectors and the contractor's foreman for work in freezing weather, which I give herewith with the hope that it may be of benefit.

SEWER CONSTRUCTION IN FREEZING WEATHER.

Use warm water and heated sand or gravel.

Use one pail salt to each barrel of water in all mortar on pipe and brick sewers.

Use less water than ordinarily and mix all mortars as dry as can be efficiently used.

Only plaster in middle of the day and see that frost is out of brick and if not take it out with water or steam jet, otherwise plaster will not stick.

Cover all joints in pipe work or masonry as fast as laid with dry earth or other material to protect from frost.

On concrete sewer, for the bottoms use salt in water, heated gravel and but small amount of water on cold days and tamp in place, and finish with top coat. Put such work in between hours of 10 to 12 a. m. if possible.

As soon as laid protect from weather by covering with manure or straw and placing canvas or tarpaulin over this; or when steam can be used excellent results can be obtained by covering with tarpaulin laid about 18 inches above the work and turning in small amount of steam. Do not turn on steam too strong but just enough to keep warm. Empty bags over straw are also a help if tarpaulin is not handy.

Be sure all ice and dirt are removed before placing side walls on bottom or arch on walls, otherwise there will be no bond.

Keep stoves or salamanders going on inside of all concrete sewers.

Cold makes cement set slow, and freezing and thawing of water in concrete before final set will ruin it.

Excavation:

It is much cheaper to thaw out ground with fire or steam than to pick frost.

Watch frozen banks for caving when frost goes out. It will drop all at once.

In back filling frozen ground allow 20 per cent. more shrinkage than when dry. (This does not apply to rock.)

Cover all work as fast as laid with unfrozen earth, if possible.

Back fill and clean up as close to work as possible before excavating materials freeze.

CHAS. P. CHASE,
Engineer In Charge.

(Please add what your experience suggests or what may arise from time to time.)

The issuing of these instructions seemed to awaken more interest in the work and cause the men to discuss the matter and think about it, with the result that several valuable suggestions were made and changes followed accordingly. I believe I am justified in saying that if any of you will follow these instructions you need not fear work in cold weather. In two winters we lost no work on account of freezing and only had two bottoms of twelve feet each that needed touching up. The steam jet was especially useful.

The materials used for concrete were clean washed river gravel containing in its natural state just about the right amount of gritty sand, and Portland cement. Every car of cement was tested for tensile strength, pat test, boiling test, and action in water and on the work. During the work three

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III. Detail of Shallow Trench Work.

cars of cement, about 600 barrels, were rejected. In two of these the cement hardened slowly and required a large amount of water and watching to keep it from slacking and going to pieces; the third car fell down all around. A record was made of the tests, of which there were over a thousand, but such tests are now so common I will not reproduce them here, but simply mention it to show the value of testing. The amount of water was watched and varied according to the practical demand of the actual conditions, varying from "no water concrete" to "slop." When using reinforcement we found it almost impossible to use a tamped "dry mixture," so-called, as the spring of the metal dislodged the concrete. The best results were obtained by using the mixture as wet and soft as it would stand, pounding down with shovels and smoothing off. Inside, the steel forms gave a finish like glass. The bottom was kept well ahead of the top so it was usually hard when the arch forms were moved. Mixing was done with Foote continuous automatic mixers, and we experienced no trouble in keeping proportions if the machine was kept clean. In fact, I liked their work better than the batch mixer on the job. Only one arch fell during construction and this was when a "wise" foreman dumped several tons of mud from six buckets about twenty-five feet drop on a green arch. It not only wrecked the arch but the steel form under it. No need to say it did not happen again. On brick and pipe sewers as well as the concrete we endeavored to mix practical "horse sense" and reason with our instructions, according to conditions and what our experience had taught would give best results. In an injunction lawsuit that developed (and failed) during construction, an engineer for the "kickers" testified that we were not measuring the ingredients (it was an automatic self-proportioning machine) and that on the brick work they were not wetting invert brick (in water and quicksand) where we had to build wooden cradles to start. I mentioned this brick testimony to the Italian bricklayer. He said "wetta hell, before I lay two brick they are so wetta they slida on my foots." Crude, but a world of truth; with no diploma, but perhaps nearly all of us in our blind younger days in commendable enthusiasm to follow the exact, hair splitting terms of the modern specifications, have "strained at a gnat" and frequently "swallowed the camel."

Owing to the extreme scarcity of labor much machinery was used on the contract. In fact, it was a "machine job." Excavation was done with steam shovels, Carson bucket machines, Parsons excavators, by teams, and by hand. The steam shovels were not a howling success in excavating, owing to the narrow ditches and not being able to blast heavily on city streets, but (take note) as the excavation was nearly half rock, in back filling the steam shovels did excellent work, which would have been impossible by team, and bankruptcy by hand. In the rock where the walls had to be close trimmed, the bucket machines made the best time, as they obtained a much cleaner ditch, completed as they went along. Both steam and air drills were used, steam being the most satisfactory but the air drills were handy in trimming up. But for the heavy work they were not in it. However, the air was utilized (take note) in blowing out the holes, freeing them from all dirt and water and in cleaning off concrete, cleaning rock, etc. The Parsons machine unfortunately got on the job in the winter with two feet of frosty macadam on the street where it was tried, which stuck it, and its next job was too soft and sticky, but when they struck the only dry earth on the job, it went along like an automobile.

The main items of contractor's plant consisted of the following:

2 steam shovels.
2 Carson bucket machines.
1 Parsons excavator.
1 air compressor plant with air drills.
2 steam drill plants, 10 drills.
4 concrete mixers.
4 extra steam boilers on trucks for warming materials and thawing ground, etc.
2 centrifugal pumps.
4 steam siphons.
1 duplex pump, 1 pulsometer.
4 hand pumps.
10 to 20 teams with dump wagons.
Hand tools, shovels, picks, etc.
Complete blacksmith and repair shop.
Cement warehouse.
Estimated value, $30,000.00.

The contractors were the Peoples Construction company of Davenport, Iowa, and they were always fair and quick to execute any proper orders and carried out the letter and spirit of the contract to the best of their ability with but little friction and much to the satisfaction of the engineer.

Cost of the work. Complete cost data were kept of the work in sections

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IV. Showing Assembling of Centers for Extension of Invert.

from start to finish. All work was in charge of inspectors who kept force account on specially prepared blanks in book form.

I give below the approximate costs.

Description.	Length, Feet.	Size Feet and Inches.	Cost Per Foot.
Steel and concrete, earth section	1,700	6 ft. 3 in. x 10 ft.	$20.00
Steel and concrete, rock section	380	6 ft. 3 in. x 10 ft.	15.00
Steel and concrete, rock section	1,360	6 ft. 3 in. x 9 ft.	10.00
Steel and concrete, rock section	372	5 ft. 9 in. x 8 ft.	10.00
Steel and concrete, earth section	500	5 ft. 9 in. x 8 ft.	11.00
Steel and concrete, circular	1,040	66 in.	6.00
Plain concrete, rock section	400	5 ft. 3 in. x 7 ft.	6.50
Plain concrete, earth section	400	5 ft. 3 in. x 7 ft.	7.00
Plain concrete, earth section	600	5 ft. 3 in. x 6 ft.	7.00
Plain concrete, rock section	200		6.00
Plain concrete, earth section	300	4 ft. 6 in. x 5 ft. 6 in.	5.90
Plain concrete, rock section	510		5.50
Plain concrete, earth section	810	4 ft. 3 in. x 5 ft.	5.00
Plain concrete, circular	376	60 in.	5.00
Plain concrete, circular	376	57 in.	4.70
Plain concrete, circular	376	51 in.	4.30
Plain concrete, circular	786	42 in.	4.00
Plain concrete, rock section	1,050	40 in.	4.50
Plain concrete, rock section	340	40 in.	4.60
Two Ring brick, circular	800	48 in.	6.00
Two Ring brick, circular	480	40 in.	5.25
One Ring brick, circular	400	42 in.	4.00
One Ring brick	1,200	30 in. x 45 in.	4.50
One Ring brick	800	26 in. x 39 in.	4.00
One Ring brick	400	28 in. x 42 in.	4.20
One Ring brick	410	22 in. x 33 in.	4.00
Vitrified pipe, kiln run	1,417	36 in.	4.21
Vitrified pipe	2,077	30 in.	3.53
Vitrified pipe	1,321	24 in.	2.20
Vitrified pipe	820	22 in.	2.10
Vitrified pipe	1,871	18 in.	1.40
Vitrified pipe	200	12 in.	.80
Catch Basins, complete	...	153 each,	25.00
Catch Basins, connecting pipe	3,973	10 in.	.45
Man-holes, complete	...	each,	30.00
Protection bulkhead, complete	...		1,300.00
Rip-rap, per sq. yd.	...	2500 yd.	1.00
Extra Concrete, under railways, per cu. yd.	...		8.00
Rock excavation, per cu. yd.	...	18,600 yd.	2.00
Rock Disposal	...		.50
Vitrified Drain Tile	...	23,872 ft. 8 in.	.25
Timber left in trench by order of Engineer, per M ft.			30.00

This constitutes about four miles of work, at a total cost of $180,000, exclusive of plant, general costs and interest, legal expenses and damages amounting to $10,000. Cost of engineering was about $5,000. These costs are according to "force accounts." The contractor lost heavily owing to the excessive rains, high water in the river, high wages and scarcity of labor, and also that the old drains were so obstructed that the soil was saturated to the limit. The bid of the contractor was $165,500.

Extra Work. When the work was commenced it was freely predicted by enemies of the project that there would be an enormous bill of extra work, but the conditions had been so carefully examined and provided for in the plans that there was practically no extra work, the final estimate being a few dollars less than the original bid.

The work was paid for by bonds of $140,000 voted under the laws for changing water courses, and an abutting property tax of the balance according to benefits. The whole construction was carried on under the writer's direct supervision, and I personally endeavored to go "over the line" once each day to watch progress (and there was plenty to see). An instrument party attended to the lines and grades and an inspector was in charge of each point of construction. The project as above contracted for was first started by the writer nineteen years ago, and it took eighteen years to see it finished, but it is done, and the haunts of the duck and mosquito are destroyed, the domestic relations of the muskrats are disrupted and broken, the turtle's trail is obliterated and he wets his back in new pools, cellars are dry, sidewalks no longer serve as ferries, and, as one old fellow told me, "You've nearly dried me well; it is twelve feet to water and it used to be two, and I want damages." Let us hope that the malaria and typhoid have sunk with the water.

In the fall of 1907 and early winter

of 1908 the detail plans for the balance of District 4 were ordered and completed, calling for about twelve miles of brick, brick and concrete, and pipe sewers. Bids were received in March, 1908, the low bid being $179,800, but owing to a political fluke, part of the work was cut out. The conditions found in this second contract are worthy of note as showing the benefit of the first work. Where last year it required centrifugal pumps and constant exertion and watchfulness to keep the water down enough to work, the ground is now thoroughly drained and dry to a depth of nine feet, and this has been the case over several miles of ditches.

CAUSES AND PREVENTION OF DEFECTS IN ASPHALT PAVEMENTS.*

By Isaac Van Trump, Asphalt Chemist, Chicago, Ill.

THERE are numerous causes of the defects that appear in asphalt surfaces, such as: Improper specifications, lack of rigid base and lateral support, lack of cleanliness, action of water, gas or both, flushing with water under high pressure, neglect of maintenance, insufficient crown, inferior sand, lack of filler, inferior asphalt or lack of intelligence in its use, careless workmanship, climatic changes, natural wear, neglect, etc. Of these causes, the first seven are almost entirely under the control of the municipal engineer, and, unless he sees that the necessary and proper precautions are taken, it would not be surprising if the lives of some asphalt surfaces, even when constructed with the best materials under laboratory control and with the highest of skilled labor, are materially lessened.

It is entirely unfair to the municipality, the tax payer and the contractor, for the municipal engineers through ignorance or neglect, to permit conditions to exist, either during the course of construction or after the street has been completed, that will permanently impair the usefulness or appearance of the thoroughfare. When the city officials are fully and properly educated to realize the importance of what may appear to be minor details, the cost to the contractor of maintaining the work for a period of years will be greatly reduced, and, the city and tax payers, being the beneficiaries, will receive better and longer service from the street for less money.

Improper specification is the cause of the failure of many asphalt surfaces; lack of rigid base and lateral support is the cause of many more. Lateral supports, such as headers, car tracks, manholes, etc., should be perfectly rigid. Car tracks should be imbedded in concrete with a triple row of bricks or blocks on either side of each rail, thoroughly grouted with Portland cement or asphaltic block filler, the latter being desirable for many reasons.

Asphalt surfaces should have proper drainage both above and below. Sufficient crowning will assist materially. Insufficient crown appears to be the general fault, although the opposite extreme is occasionally found. One of the main thoroughfares in the City of Mexico has an 8-inch crown with but a 22-foot roadway and I frequently noticed, while there, the large number of horses that fell on the wet street owing to the extreme arch of the pavement caused by the high crown.

Roughly estimated, the average crown for a level asphalt street is 1 inch to every 5 feet in width. However, as the grade of the street increases the height of the crown is reduced. The formula adopted by the City Engineer's Office, Omaha, Neb., in 1902, is as follows:

$$C \text{ equals} \frac{W\ (100\text{-}4f)}{5{,}000};$$

C—Crown of pavement in feet;
W—Distance between curbs in feet;
f—Number of feet fall per 100 feet of street.

Persons disapproving of asphalt pavements make the claim that sheet asphalt cannot be laid satisfactorily on streets having a high percentage of grade. In reply to this allegation, it can be said that there are numerous instances, in all parts of the country, where this form of pavement is giving excellent results on streets of 10 per cent. grade and in several cities this figure has been greatly exceeded, such

*From an address at Notre Dame Univ., Ind.

as; Scranton and Kansas City, 12.5 per cent.; San Francisco, 16 per cent.; and in Pittsburg, 17 per cent. grade has been reached and is giving satisfactory service.

In cities where illuminating gas is used, it is a common occurrence for asphalt surfaces to disintegrate in spots, caused by leaks in the gas mains. It is useless to merely repair these spots, as the patches will soon disintegrate also. The only way to stop this disintegration is to stop the leak.

The action of continued standing or running water will in time destroy the best asphalt surface. This form of pavement will, however, withstand a reasonable amount of water for years.

Water, acting on the asphalt surface from beneath will in time, cause the pavement to seriously disintegrate, especially in winter when the moisture absorbed by the mixture freezes, breaking the bond between the grains of sand. Therefore, it is extremely essential that such form of construction be employed that will entirely prevent water from attacking the pavement in this way.

The actions of climatic changes cannot be entirely overcome, but they can be guarded against if the contractor employs the proper skilled labor, that is, an asphalt expert, under whose supervision the pavement should be mixed and laid. Such an expert should inspect the scene of the improvement before the work of mixing the binder and topping is commenced. He should note the width of the thoroughfare, the character of the buildings facing the street and the various businesses conducted therein, as this will assist in determining the volume and character of traffic the pavement is to carry. The direction the street trends, north, south, east or west, together with the height of the buildings and the presence of shade trees will have an important bearing on the degree of softness of the wearing surface. Whether or not the proposed improvement is near a main artery of travel and will divert a large amount of traffic owing to the wretched condition of adjacent parallel streets should be noted, so the mineral aggregate and also the consistency of the asphalt cement can be regulated accordingly. A perusal of the specifications will inform him as to the thickness (also the proportions) of the concrete base, the binder and the wearing surface.

All these and many other details of importance will manifest themselves instantly to the experienced eye and the trained mind of the expert, who, being thoroughly familiar with the many different sands, asphalts and fluxes (with their numerous individual characteristics) in use in various parts of the country, is in the position to produce the most durable and satisfactory surface mixture that can be made.

The skill employed by a contractor should receive serious consideration from the municipal engineers, for it is as important that a pavement be laid in a skillful and scientific manner as for the materials to be of the best quality. A pavement containing the best of materials but laid by unskilled workmen is usually inferior to one made with poorer ingredients but which were scientifically and intelligently combined and laid. Thus the tax payer and the city, as well as the contractor, are materially benefited by the employment of skilled and specially trained workmen.

The flushing of streets, if properly done, will do an asphalt pavement no harm, but in some cities such high pressures are used that it would not be surprising if some asphalt surfaces were injured.

Neglect of maintenance is another serious error on the part of many city officials. This economic problem is usually attended to in a reasonably conscientious manner. There are but one or two cities in the United States where no attempt is made to maintain asphalt streets after the guarantee period has expired, and they are, consequently, after a few years, in a wretched condition, causing adverse criticism of this form of pavement on the part of the citizens. As a matter of fact, an asphalt pavement, if well constructed and properly maintained, is the equal of any form of pavement now in use.

In conclusion I would again caution the municipal engineer as to the importance of proper specifications, rigid base and lateral support, proper drainage, sufficient crown, proper street cleaning facilities and soft wearing surfaces, for usually, the softer the pavement, to a reasonable limit, the longer its life.

EDITORIAL COMMENT

The Municipal Business Manager.

Control of Public Service Corporations.

THE MUNICIPAL BUSINESS MANAGER.

The article elsewhere in this number of MUNICIPAL ENGINEERING by Ernest S. Bradford, describing the office of business manager, created by the city council of Staunton, Va., and giving some hints of the manner in which it is administered, is extremely interesting. It shows, as well as a year of experience can show, the advantage city councils can find in operating their departments according to the methods in use in other business corporations, for, as MUNICIPAL ENGINEERING has long contended, the municipality is simply an organization formed by its citizens to do certain things which they cannot do so well, if at all, for themselves. It is not a money-making company, but is a money-spending organization. Therefore its efficiency cannot be judged by the ordinary rules of business corporations, for it has no cash profits to distribute in the way of dividends.

It is evident that, on this account, the members of the corporation must take even more pains than the stockholders in a commercial organization to check up their officials, to supply them with definite plans and policies. So long as the town meeting was small enough so that everyone could have a word, little machinery was necessary, but when the population becomes large enough so that there is a large proportion of people who are indifferent to the form of government so long as they are not disturbed, the opportunity of the man in politics for the benefit of his pocket or the pockets of his friends arrives. Then it becomes necessary to differentiate and to assign various duties to various departments, with proper mutual checks and proper conferences, cooperation and coordination.

The common form of city government is an application of the principles on which the national government is founded, but, since the duties of the municipality are largely different from the duties of the Nation or in slightly less degree from the duties of the state, strict adherence to the same form of government leads to division of responsibility, lack of the control which the courts exercise in the political form of government, and exhibition of the effect of the lack of interest in details which is a characteristic of the American citizen. The result is the unsatisfactory condition of municipal government which exists in nearly every city whether large or small.

While the Indianapolis plan, one of the earliest attempts to produce a business like organization, has the same dependence upon the form of the National government, it does away with one of the major defects in municipal organization, in that it concentrates responsibility largely in one man, who can be dropped out whenever he becomes unsatisfactory. He is, however, responsible for the executive functions of the city government, only. The election of councilmen by wards has resulted in a low standard of membership which has injected into the practice of municipal government some ideas which do not belong there. This has probably been corrected by the newly adopted plan of selecting councilmen and electing them by the vote of the city at large. The direct check upon the Mayor has, however, been weakened by extending his term to four years.

Theoretically, the Indianapolis plan, which is now that of all Indiana cities, makes the legislative body a check on the executive, and definitely locates the responsibility for success or failure.

The Commission plan, applied to so many cities in recent years, is a material departure from the constitutional form of government and, while concentrating all the functions of government in a very few men, at the same time distributes the responsibility for defects in the legislative branch by providing a several headed commission, each head equally irresponsible in general matters at the same time that he is responsible in certain particular matters directly assigned to him. There are thus two sources of weakness, which will show as time passes and conditions change. The Commission plan reduces the council to a minimum and makes it at the same time the executive force of the municipality. It is a reversion to the town meeting, with the difference that those eligible to attend the town meeting are chosen at a general election.

The Staunton plan retains the old council form of government, but the executive departments of the council abdicate their office and turn the duties over to an expert to perform them under the general direction of the council itself. This is hardly the combination of legislative and executive functions which Mr. Bradford assumes in his article above referred to. It is, as just stated, the delegation by the legislative body of the executive functions, which that body possesses in most cities of the United States, to an executive acting under direct orders and with frequent consultations. The larger cities, many of them, have officers in various departments corresponding to the business manager in Staunton. The smaller cities, at least all of them still under the Mayor and Council form of government, need the business manager.

The analogy of the business corporation and the municipality is not complete under any of these forms. It is closer under English forms. In the first place the voters should be stockholders, that is, they should have a pecuniary interest in the proper conduct of the city's business, determined not alone by payment of taxes but in part by payment of rental or some other evidence of interest in the consequences of their action in voting. The stockholders elect directors, who in turn elect president, general manager and other executive heads, their number and inportance depending upon the extent of the business. These directors, at least in theory, are elected by the stockholders at large and not by any group of them, made geographically or otherwise. The directors, and frequently the stockholders, select examining committees whose business it is to keep a supervising eye over the conduct of the business, although they have nothing but advisory power. This function is performed in American cities by the Commercial Clubs, Civic Leagues and other similar bodies, one of the most successful of which is the New York Bureau of Municipal Research.

In the business corporation the governing committee, the board of directors, is elected every year by the stockholders. It immediately differentiates itself, retaining its legislative powers, and delegating its executive duties to the experts within and without the body itself. The board shows each year its reason for continuance in office and its executive officers are proved up even oftener. The nearer the municipal corporation comes to this delegation by the people of authority to a limited number of men selected for their competence as directors, and the further delegation by these directors of their executive power to experts in the respective departments, thus fixing responsibility directly, first upon one selected executive head, and then upon his subordinates responsible to him, the nearer to economy and efficiency our municipal governments will approach.

If to this is added such supervisory bodies as the state public service commission and the uniform public accounting bureau, whether in one or in two offices, the cities of a ctate, particularly the smaller cities, will find their official families reduced, their expenses reduced, the results of their expenditures improved and the dangers of misapplication and misappropriation of funds diminished.

CONTROL OF PUBLIC SERVICE CORPORATIONS.

One of the duties of any form of government is to supply certain daily needs and perform certain services for the citizens which they cannot perform for themselves or which can be done better when done wholesale rather than individually.

Every branch of government from nation to city or town has more or less of this sort of duties to perform, but the relative amount of them rapidly increases as we come down the scale until we come to the municipality, whose duties are almost entirely of this nature.

Some of these duties are of the nature of monopolies, i. e., it is impossible to open them to competition under the ordinary conditions of business. Some of them may perhaps be open to a limited competition, but usually under conditions which result in expensive duplication and final combination with loss to the investors, or to the public, or to both.

All these duties may be assumed by the municipality directly and we then have what we call municipal ownership of public service industries. Many of them may be intrusted to private parties, in which case we have public service corporations. In every city in this country the streets and their pavements are under municipal ownership. In all but a very few the sewers are under municipal ownership. In a majority the waterworks are under municipal ownership. Lighting, public and private, is nearly equally divided between municipal and private ownership. Street railways are practically all in the hands of public service corporations, so are telephones.

Municipal ownership seems to be successful in inverse proportion to the number of persons employed in the service. Likewise municipal ownership is most successfully applied to the various public service industries somewhat in proportion to the character of the service; in those industries which have a large share of service to the public at large municipal ownership being more popular and more successful than in those which serve the individuals in the municipality, and whose service to the public at large is less obvious. This is exemplified in the list of public service industries just given.

When the municipality farms out any service to a corporation, the contract should be based upon certain fundamental principles which may be briefly stated. In very few of the earlier contracts with public service corporations, or franchises, were these principles considered, mainly from ignorance of their importance, but also because the cities were small and young, the chances for loss and gain were great, nad the service was demanded at any reasonable cost as a necessity in the competition with other progressive cities. We have many of these unscientific franchises still in use, but the tendency in the case of those which have definite terms is to put them on the better basis, when they are renewed, and in the case of those which are claimed to be perpetual, to take advantage of new necessities to secure modifications, or in some cases to abrogate such franchises as invalid or against public policy.

In the first place good service must be guaranteed.

Second, all the service, public and private, must be paid for and rates must be uniform for uniform service, or proportional in case amount of service varies.

Third, rates must be sufficient to pay what the service costs. In the cost of the service must be included every item of cost, including maintenance and operation, repairs and renewals, sinking fund, interest, reasonable dividends on the actual cash investment in the plant, and contingencies of management and accident. That the cost may be known by both parties to the contract there must be

Fourth, publicity of accounts, public auditing and checking, and some form of municipal approval of changes in capital account, such as issues of stock and bonds, character of investment of the proceds thereof and disposition of surplus or deficit, with accompanying power to modify rates.

The effect of politics upon the success of municipal ownership is often presented as an argument against that method of operating public service industries, but the same influence is evident in the relations of the municipality to its public service corporations, often with equally objectionable results. Ignorance of the technical business and operating conditions has an equally serious effect upon the success of municipal ownership and upon the success of municipal control of public service corporations.

Some states, notably Massachusetts, for some classes of public service industries, New York and Wisconsin are doing much to offset the effects of such ignorance in municipal officials, whether on municipally owned plants or on private corporations, through expert state commissions, which, when really expert and honest, are able to reduce all contracts to conformity with such principles as those stated and secure equity for both parties to them.

Indiana does not have a public service commission and Indianapolis had in the board of trustees of its Consumers' Gas Trust Company a very good substitute for the state commission, because that body was a permanent body of the best citizens which controlled the operation of the company for the benefit of its patrons and of the public at large. The failure of natural gas put that company out of business, but a new one formed on the same basis, the Citizens' Gas Company, is just beginning the manufacture of gas and promises to be successful.

The city of Crawfordsville, Ind., is considering a new form of telephone contract which embodies the same idea of control of the public service corporation by a body of prominent and reliable business men, the control in this case to be exercised through the lease of the operation of the franchise to a regular corporation, either one of those now in business in the city or a third to be formed with the purpose of combining all the plants into one. This franchise or contract is not as yet favorably considered by the city council, but is being pressed by the Commercial Club.

The state commission has at least two prominent advantages over such local governing bodies as the boards of trustees named. In the first place they are very nearly independent of local pressure so that they carry on their investigations and make their decisions without bias. In the second place they have in their employ experts even more independent, who know more, both practically and theoretically, concerning the technical and financial problems arising than such boards of trustees can ordinarily be expected to know. The boards of trustees cannot retain such experts in their permanent employment, but must operate as best they can under ordinary conditions, calling in special assistance of greater or less value at such times as it is demanded.

THE QUESTION DEPARTMENT

Concrete Street Pavements.

The writer is interested in the construction of concrete street paving and wishes to learn as much as possible through your valued medium regarding this class of street paving from the bottom to the finish, giving an idea of each process and the grade of material used.

We should also like to have a small list of contractors who have had experience in the making of this kind of paving and who are making a specialty in this line.

We should like to know the successes, also the failures of this type. Is it noisy? Is it slippery in wet or frosty weather? Is it easy to make repairs where large

cracks appear? And why are not the climatic conditions here favorable to that style of street paving when the sidewalks so constructed are so durable?

E. W. D., ———, Ill.

Specifications for and full descriptions of the principal forms of concrete pavements will be found in MUNICIPAL ENGINEERING. Lists of these articles are given in the January number, vol. xxxvi. p. 32, and in vol. xxxii, p. 89, to which reference should be made for details. The "Handbook for Cement Users" ($3) also contains specifications used in constructing successful pavements.

With reference to the specific questions asked, the reports from existing pavements indicate that the concrete pavement is no more noisy than any other hard pavement, and less noisy than rough granite pavements. If the blocks are large the pavement is somewhat slippery at all times and is not affected as much by wet or frost as some other smooth pavements. Repairs are made by cutting out the defective blocks and replacing them by new blocks. They are readily made. Concrete is a comparatively brittle substance and must be so treated as to reduce the shocks from wheels and horse shoe calks as much as possible. Unless well designed and built of proper mixtures of materials properly laid, the pounding of traffic will wear ruts, especially along joints, and will wear holes where a defective spot or joint gives opportunity for the pounding to have its full effect. There are some good pavements under comparatively light traffic, and there are some poor pavements under equally light traffic. Like all other pavements, this one must be well laid to demonstrate its success most fully. There are considerable differences of opinion regarding the value of concrete for paving purposes, but the above statements express the preponderance of evidence. The fact that the Bellefontaine, O., pavement exists in a very passable condition after nearly twenty years wear with little or no repair is evidence that the pavement has much merit. The new forms of concrete pavement, such as the granitoid concrete block pavement described in vol. xxxv, p. 369, should be much better than the old, because they are built on more scientific principles.

For names of contractors who will lay the pavements, reference may be made to the "Business Directory" printed in each number of MUNICIPAL ENGINEERING, under the headings "Artificial Stone Sidewalks," "Cement Paving," "Concrete Work," "Contractors," "Granitoid Concrete Block Pavement," "Pavements," "Paving Contractors."

Who Makes Steel Molds for Concrete Construction?

We would like to be placed in communication with parties manufacturing pressed steel molds to be used in monolithic construction.

There are a number of molds of this kind on the market, but they are all cast iron, and hence are cumbersome. What we want is a pressed steel mold.

L. A. W., Waterloo, Iowa.

Can our readers refer us to such molds? Pressed steel forms are made by several manufacturers, and they can doubtless make to order what is wanted. Among these manufacturers are:

Globe Machine and Stamping Co., Cleveland, O.

Pressed Steel Car Co., Pittsburg, Pa.

Standard Gauge Steel Co., Beaver Falls, Pa.

Waynesburg Pressed Steel Co., Waynesburg, Pa.

Worcester Pressed Steel Co., Worcester, Mass.

Amount of Water in Concrete.

I built 3,000 ft. of curbing 18 inches in depth and 6 inches in breadth. The top and front side of curbing to a depth of 8 in., on the front side, was finished with a top layer 1 inch thick of sand and cement. There was 36,000 square feet of sidewalk, 3-inch concrete base with a top finish 1 inch thick, composed of sand and cement, proportions of the mixture as follows: Concrete, 1 part cement, 2½ parts sand, 5 parts gravel; The top layer in all cases was one part cement, two parts sand. The mixtures were made very stiff, necessitating the minimum amount of water. I estimated the amount of water used by the method shown on p. 266, of Gillette "Hand-book of Cost Data." The amount of water I estimated as used in this work is between 16,000 and 17,000 gallons, and I would like to know if you think this estimate is correct.

O. S. H., Maysville, Ky.

Any estimate of the amount of water used in concrete must be indefinite unless several things are well known, such as the kind of cement and the brand, there being considerable differences between brands of cement made of different materials; the dryness of the sand and the gravel; the fineness of the sand; the porosity of the stone; the condition of the atmosphere, etc.

The rule given by Gillette corresponds quite closely with the specification made by U. S. Army engineers, who prefer rather dry concrete, so that it is a minimum estimate for the amount of water to be used in the mortar. The rule covers the mortar only, and the gravel or stone also requires some water.

Neat cements vary in the amount of water required to gage them from about 22 to about 30 per cent. Fine sand requires some 23 per cent. of water to gage it, while coarse sand requires only 3 per cent., according to French experiments. The absorption of water by the stone varies from 2 or 3 per cent to 15 or 20 per cent. A materially larger percentage of water is required in a dry than in a moist climate, or on a dry than on a moist day, in proportion to the evaporation of water by the atmosphere.

If the Gillette rule is applied to the

mortar only, the amount of water in the work under consideration would apparently be less than 10,000 gallons, but, as above stated, the rule is based on a minimum of water, and the aggregate would require some additional water if it were not already wet, so that the actual amount of water used might easily be 50 to 100 per cent. more than the result of the computation would show.

The effect of the judgment of the concrete mixer as to the proper consistency of the concrete is not taken into consideration in the above. It adds another source of large variation.

The writer would not be willing to make a closer estimate without full knowledge of the materials and the conditions under which they were used.

Will our readers give the results of their observation, actual measurements if possible?

Book on Gasoline Engines.

We would like to know where to secure a book that would give information in regard to developments and progress of the gasoline engine. In other words, giving information in regard to gasoline engines from their beginning to now.

A. B. & M. Co., Little Rock, Ark.

Perhaps Hiscox's "Gas, Gasoline and Oil Engines" ($2.50) will give the information desired.

What Is Resurfacing of a Street?

The late legislature, in the street improvement law, included a provision that "resurfacing" a street on the present foundation, can be assessed against the abutting owner, the same as a new improvement. The question is, what constitutes a "resurfacing." Do you know of any decisions, or technical meaning established in regard to this? The point with us is, Does removing or regrading the surface of an old gravel or macadam street, and applying new stone, constitute such a "resurfacing?" If you can give me any information as to this I will thank you heartily for the courtesy.

FRED R. CHARLES, City Engineer,
Richmond, Ind.

The charter of the city of Indianapolis, which is the basis of the present charter for all the cities of the state, provided that the cost of the construction of streets should be assessed on the abutting property, but that the streets thus constructed shall be kept in repair by the city. When a few asphalt streets got beyond repair and entire refacing became necessary the question arose as to who should pay for it, i. e., whether the resurfacing would be new construction or repair. The matter settled itself practically because the city would not resurface the streets and, it being merely a question of time until the foundation wore out and entire reconstruction became necessary, it was evidently cheaper for the property owners to pay for the resurfacing. The final court decision classed the resurfacing as a new pavement.

Scraping the surface of a macadam pavement, revising its crown and grade, to make it serve as the foundation for a new wearing surface, has been considered as a new construction, or could be considered a resurfacing, there being no difference in the eyes of the present Indiana law. Whether the new surface should be asphalt or brick or tarred macadam or plain macadam would seem to make little or no difference. Just how thorough a reconstruction would be necessary to make the work resurfacing rather than repair it is difficult to say, in the absence of any definition by the courts of the state.

These questions have very different answers in other states. In some the property owners pay once for the construction of the street and are forever relieved from street assessments thereafter. The decisions went so far in Kentucky at one time as to relieve property, which had paid for macadamizing a road at some date in the distant past, from any necessity for payment for a street pavement when the property was taken into an incorporated city.

How to Build a Macadam Road.

I am contemplating building about a half-mile of macadam road about 18 feet wide. I have talked to several engineers on the subject, but I am anxious to know the most economical way to build it to make it a durable, clean road. We have no gravel and have to ship limestone in at a cost of about $1.75 a ton. We put in about a half mile of brick paving last year and contemplate putting in some more this year. Have you articles on the building of macadam roads which you can send me? I would like to have one also on water works.

J. S. GEDNEY, Mayor,
Lebanon, Ill.

There is a brief description of the construction of a gravel macadam road in Indiana in MUNICIPAL ENGINEERING, vol. xxxvi, p. 158. Ohio practice is described on p. 209 and the method of building highways in New York is quite fully described on page 46 of the same volume.

Articles in vol. xxxv, on macadam paving and on substitutes therefor to stand the new wear from automobiles are as follows:

"Sicilian Asphalt Macadam Pavement," p. 402.

"Asphaltic Country Roads," p. 386.

"The Effect of Automobiles on Macadam Roads," p. 236.

"Cement Macadam Streets in Germany," p. 36.

"The Blome Concrete Pavement," p. 369.

"Progress of Dust Prevention," p. 126.

"Calcium Chloride as a Dust Preventive," p. 183.

"Dust Prevention by Chemicals," p. 175.

"Use of Tar and Oil on Macadam Roads," p. 246.

"The Mineral Rubber Pavement," p. 372.

"Cost of Road Building," p. 78.

"Results of the International Road Congress," p. 379.

"Benefits of Good Roads," p. 319.

"Economy of Tarvia Treatment of Roads," p. 400.

"Keep Good Roads in Repair," p. 392.

"Good Roads Convention," p. 331.

"Some Oiled Earth Roads in California," p. 284.

"State and State-Aid Roads in Washington," p. 257.

"The Oiled Roads of Santa Monica, Cal.," p. 223.

"Technolithic Pavement," p. 125.

Preceding volumes are equally rich in timely articles on the subject.

There are so many articles on water works that reference may be made to practically any number for several years. Names of articles on special water works subjects will be supplied on request. Back numbers of MUNICIPAL ENGINEERING can be supplied, usually at 25 cents each.

Information About Municipal Water Supply and Electric Light Plants.

I wish to secure some data relative to municipally owned and operated water supply and electric lighting plants.

I particularly desire information as to the cost of operation, charge made to consumers and earnings of such plants, and would be particularly interested in works located in the Middle and Eastern States.

Can you inform me where I can secure such data? A. W. V., Westfield, N. J.

Rates for lighting are given in considerable detail in an article in MUNICIPAL ENGINEERING, vol. xxxvi, p. 33. Tungsten lamps are compared with arc lamps on p. 216.

In vol. xxxv, p. 35, is a list of articles and sources of information about the cost of operating municipal lighting plants.

A list of recent articles on water rates will be found in vol. xxxvi, p. 178. There is also a good article on p. 212.

A list of articles on municipal ownership of water works, several of which give information about cost of works and of operation, will be found in vol. xxxv, p. 383, also one on prices for water and light on the same page.

The report of the Commission of Gas and Electricity of New York for 1907 gives much information in form of summaries for each electric light and gas plant in the State. The reports of the new Public Service Commission, when available, will doubtless bring this information down to date. The report can probably be obtained from the Public Service Commission at Albany, N. Y.

The annual reports of the Board of Gas and Electric Light Commissioners of Massachusetts give operating data of many plants and balance sheets, manufacturing accounts and profit and loss accounts of both municipal and privately owned gas and electric light plants. The report for the year ending June, 1908, was recently issued.

There are no such collections of data as these regarding water plants, but doubtless the reports of the New York and Wisconsin state commissions will give them as soon as they are in full operation.

Information About Sand and Mechanical Filters for Water.

I would like references to articles in your magazine about sand or mechanical filters. Our water supply has been declared unfit for use without filtering. We use river water and at one time were thinking of sinking wells, but the cost of getting water at a depth of 1,500 feet to supply the city would bankrupt us in a short time, so we intend to put in a filtering plant this summer.

S. C. W., ———, Minn.

Following are some of the excellent articles in MUNICIPAL ENGINEERING on the subject of water purification:

"Importance of the Proper Operation of Water Purification Plants," vol. xxxv, p. 352.

"Water Rates and Rentals" showing the need of increase in rates to meet increased cost when purification becomes necessary, vol. xxxv, p. 73.

"Cost of operating Sand Filters," vol. xxxv, p. 252.

"Purification of Water Supply at Lawrence, Mass.," in slow sand filters, vol. xxxiv, p. 209.

"The Copenhagen Water Supply," vol. xxxiv, p. 349.

"The Removal of High Turbidity from Water Without the Use of Coagulants," vol. xxxiv, p. 240.

"The Water Filtration Plant of Harrisburg, Pa., vol. xxxiii, pp. 155, 221, a detailed account of the design and construction of the plant.

"Results of Filtration Experiments in Washington," vol. xxxiii, p. 112.

"Success of Washington Filtration Plant," vol. xxxiii, p. 46.

"The New Orleans Water Works," vol. xxxi, p. 429.

"A Slow Sand Filter for Lawrence, Mass., vol. xxxi, p. 92.

"Books on Filtration and Analysis of Water," vol. xxxi, p. 397.

Condemnation of Sewer Right of Way by Private Corporation.

I beg leave to request you to send me such copy of your valuable publication as may bear upon the following subject.

A water supply company desires to develop a water works for a suburban tract. They also wish to introduce in this suburban tract a system of sewerage. The outlet for such system passes through the land of another party.

Has the water supply company the right to condemn a right of way for the sewer through the lands of the other party? It is, of course, understood that a town has the right to do this, but the question is whether a water works company, incorporated with a view of supplying water, has the right of condemnation for the outlet of the sewerage from this water.

C. P. E. B., Richmond, Va.

This is a question for an attorney familiar with the laws of the State in which the

property is located and with the charter of the water supply company. If, as is probably true, the articles of incorporation of the water supply company give it power to supply water, but not to drain it away either over or under the surface, the courts would probably hold, as they have frequently, that the company is restricted to the objects named in its charter, and cannot build sewers. It is doubtful whether the owners of the tract of land could condemn the right of way for a sewer through adjoining land, though, as in a Michigan decision, 53 N. W. Rep. 7, they would have the right to empty their drains into an existing line of drainage over such land, provided they did not concentrate enough water from other areas to overflow the existing channel and cause damage. There are also many decisions that this drainage cannot be such as to produce a nuisance on the adjoining land. It is probable, therefore, that no authority can be found for the condemnation of the right of way desired, unless it is in the articles of incorporation of the company or an act of the State legislature covering the case. Can our readers cite any cases of this sort and tell what was done with them?

Forms of Contract for Electric Current.

This Borough is about to install electric meters and the question arises as to the best form of contract between the Borough and the individual consumers of electric current.

Do you have any sample forms of contract for such purposes? We want to start as nearly right as possible and are seeking information and suggestions on the subject.

If you have anything that will help us or can point to some source of knowledge we will appreciate it very much for your aid. D. L. G., ———, Pa.

The following is the very simple form used in Grand Rapids, Mich:

APPLICATION FOR ELECTRIC CURRENT.

GRAND RAPIDS, MICH, ...190...

To the Edison Light Company of Grand Rapids:

..... wish to be supplied with electric ..... at premises known as ..... St., occupied as ..... and agree to pay for same on the terms established by the Company and to comply with the Rules and Regulations of the Company.

Signed, ...,

.....

RULES AND REGULATIONS.

Burned out lamps replaced by the Company. Lamps broken or lost to be paid for by consumer.

The minimum charge to residences for service and use of each meter is one dollar per month.

All bills are to be promptly paid when due, and in default of payment of same the flow of electricity may be stopped until bills are paid.

The Edison Light Company shall have free access into the premises for the purpose of examining the meters, lamps and wires, or the removal of same.

The subscriber must notify the Company at their office when he ceases to use the light.

Consumers will be expected to send to the Company's office for new lamps in exchange for old ones.

On the back of this application appears the following:

Deposited $.....
Date of Deposit Receipt,.....
I hereby guarantee the payment of all bills on this application when due, until notice to the contrary, in writing, is given to the Company, at their office, by me. Value received.

Signed, ...

The deposit receipt above referred to reads as follows:

Edison Light Company of Grand Rapids.
Office cor. E. Fulton and Calder Sts.

Grand Rapids, Mich., ...190..

Received from ....., ... dollars as a deposit, same to be refunded when ..... is discontinued, account settled and this receipt returned.

Edison Light Company of Grand Rapids,
$..... By.....

There is also a receipt for apparatus as follows:

Grand Rapids, Mich., ...190..

Received from Edison Light Company of Grand Rapids, the following goods, the safe keeping of which we will be responsible for, in accordance with the Company's "Rules and Regulations."

There are lines for each item, Night Lamps, 8, 16, 24 c. p. lamps, plain and the same frosted, and 20, 32, 50 and 100 c. p. lamps, plain, with line for signature.

The duplicate memorandum of this receipt, left with the customer, has the same rules and regulations printed on the back which appear on the application for service.

The Indianapolis Light and Heat Company has a more elaborate contract as follows:

CUSTOMER'S APPLICATION AND CONTRACT.

INDIANAPOLIS, IND., ...190..

The undersigned ....., hereinafter called the customer, who is the ..... of premises covered by this agreement, and engaged in the ..... business at ....., hereby makes application to Indianapolis Light and Heat Co., hereinafter called the Company, for a connection permit and for service to be rendered by the Company at premises No..... Street, occupied as a ....., and to be paid for by the customer at rates hereinafter mentioned, service and rates being as indicated by the following schedule and as otherwise stated herein.

(Schedule is inserted here.)

The customer agrees to use enough electric current, in case same is to be measured by watt-meter, to make a (weekly monthly) bill of ..... for each ..... connected, or pay the amount of said bill should sufficient current be not used to make a bill of that amount.

The customer further agrees to use the above apparatus and electric current for same only as indicated and stated herein, and pay the Company at its office as indicated and stated herein for the service of each (week, month) on the first day of

the next succeeding (week, month) except when that day falls on Sunday, in which event payment shall be made on the following Monday, without relief whatever from Valuation or Appraisement Laws.

This application is subject to the conditions, rules and regulations printed on the back hereof, and to such further reasonable rules and regulations as may hereafter from time to time be adopted by the Company concerning the supply, use of and payment for electric current and which shall have ben approved by the Board of Public Works of the City of Indianapolis.

The written acceptance of this application by the Company or one of its contracting agents, shall make this a contract between the parties, including said conditions, rules and regulations and shall be binding on the respective parties and their executors, administrators, heirs, successors and assigns.

See conditions on back.

Signed, ...

By.....

Accepted .....190..

Indianapolis Light and Heat Co.

Per.....

In Duplicate

The schedule referred to has blanks for number, kind and capacity of apparatus, maximum load of motor, hours of service, days per week of service, length of service and for various rates. The rates are for weekly or monthly contracts and are in three parts, (1) electric current, (2) renewals, (3) for carboning. The contract may be made per kilowatt-hour measured by watt-meter, per .... watts indicated by am-meter and volt-meter with maximum load on motor, or flat rate.

The conditions on back of contract are as follows:

The term "carboning" a service, as used on the opposite side of this application, means and includes the use of the necessary arc lamps, repairing and cleaning them, supplying and replacing, when broken, the necessary globes, supplying the necessary carbons, and placing the carbons in the lamps in proper position to burn, and no charge for same shall be made, except in case of repairing damage done in violation of the terms of this contract. In case the service "carboning" is to be rendered by the Company, the necessary arc lamps are to be furnished by it and remain its property, otherwise said arc lamps are to be furnished by the customer and remain his property.

The term "renewals" a service, as used on the opposite side of this application, means and includes the use of the necessary plain standard incandescent lamps, the supplying and replacing when burned out of all such incandescent lamps and fuses, and no other charge for same shall be made, except when lamps are broken and fuses blown, in violation of the terms of this contract. In case the service "renewals" is to be rendered by the Company the first set of incandescent lamps and fuses are to be furnished by it, and it is entitled to one complete set of same at the close of this contract, otherwise all incandescent lamps and fuses, except main fuses, are to be purchased from the Company by the customer and remain his property.

If the rate charged by the Company for current for incandescent electric lighting is indicated on the schedule as ten (10c) cents per thousand watts, the Company shall furnish, place and maintain wires or conductors necessary to conduct such current onto or into the premises to be supplied, without additional cost to the consumer, and will make no charge in supplying such electric current for incandescent lighting or for "renewals" including lamps, carbons and fuses, except when actually supplied, and the charge for such "renewals" shall not exceed cost with ten (10) per cent. added.

The Company shall furnish the necessary meters for the measurement of the electric current supplied and used in such service without cost to the consumer.

Except as above provided, the placing and maintaining of all electrical apparatus and all wiring and connections for same shall be done by the customer at his expense, and in accordance with the Company's permit, the rules and requirements of the National Board of Fire Underwriters, City Authorities, and the printed rules of the Company; and at any time that any change in said rules, or addition thereto may be made, the customer agrees to make, or cause to be made, the necessary change or alteration to make said placing, wiring and connections conform to said change in rules or additions to the same.

All motors are to be furnished by the customer, kept in order at his expense, and remain his property.

The customer shall obtain or cause to be obtained all permits except street permits, or certificates necessary to give the Company or its agents access to the equipment and to enable its conductors to be connected therewith, or for other purposes under this contract.

In case of removal this service is to be used at new location except during the time customer may be located where service cannot be supplied, and in the latter event this contract shall be inoperative.

In case this service is for business purposes and the business be suspended or discontinued, this contract shall be inoperative after written notice from the customer until business be resumed.

The customer further agrees that no electricity for light, heat or power other than that covered by this contract shall be used upon his premises named herein, or in rooms or apartments covered by this agreement, without the written consent of the Company endorsed hereon, and any violation or threatened violation of this stipulation may be enjoined by any court of competent jurisdiction.

For any additional electric service desired under this contract the customer shall make an increase application and secure a written permit before allowing any additional connection whatever to the Company's supply of electricity.

The customer shall exercise due care for the protection of all lamps, motors, meters, wires, fuses and other equipments, and be responsible for the safe keeping of the same inside the building, allowing no person to have access thereto except the Company and its employes.

On the expiration of this contract, or should the payment be not made as herein agreed upon, or the remaining stipulations and agreements of this contract, or any other contract by and between the parties hereto, be not complied with upon the customer's part, the Company, or its employes, may at the Company's option, without legal process or further permission, enter and remove, at any time, all lamps, motors, meters, wires, fuses and other electrical apparatus furnished at the

expense of the company, without incurring any liability for so doing.

The Company or its employees shall at all times have the right to enter the said premises with full and complete access to all lamps, motors, meters, wires, fuses and other electrical apparatus for the purpose of reading meters, testing motors and meters, trimming and renewing lamps, and looking after motors, wires and fuses, or any trouble that might arise.

This contract is to be considered renewed from term to term after the expiration of the term mentioned on the opposite side of this application, and for the same period of time, unless a written notice to the contrary is given by either party within three (3) months after the expiration of any term, and prior the the giving of such notice the terms and conditions of this contract shall remain binding upon both parties thereto.

Temporary failure on the part of the Company to furnish the electric current for said light, heat or power by reason of accident, breakage, making of necessary repairs or replacements, or other cause shall not cancel this contract, nor render the Company liable for damages beyond a pro rata reduction from its bills for the actual time of such failure.

Claims for non-service, to be valid, shall be made in writing within one week of the time when such non-service occurred.

The Company is hereby released from all claims on account of damage to person or property, caused wholly or in part by electric current, or by wires or other electrical apparatus.

Rates for Telephone Service.

Will you kindly inform me where I can get information as to the rates charged for independent and the Bell telephone service in cities of about 7,000 to 8,000 inhabitants for business and private houses. I would like to have information as to what the charges are for this service and a number of cities in which the franchises have been renewed in the last few years, also if many of these towns are receiving a per cent. of the gross income monthly.

C. L. B., Ottawa, Kan.

A committee of the Commercial Club of Crawfordsville, Ind., has recently made an investigation of telephone companies in cities of about the same population, 5,000 to 10,000 and has printed its report in a small pamphlet. The following figures are taken from that report for cities having both Bell and independent telephone companies, the larger rate in each case being for telephones in business houses and the smaller in residences.

The cities reporting but one company have rates which lie between those given in the above table, $24 and $12 being the minimum and $30 and $18 being the maximum except in Jeffersonville, Ind., which pays $42 and $24.

But two cities in the list receive any payment from companies, Sedalia, Mo., whose companies pay into the city treasury 2½ per cent. of their gross income,

RATES FOR TELEPHONE SERVICE.

Cities.	Independent Co.'s.		Bell Co.'s.	
	No. Phs.	Rates.	No. Phs.	Rates.
Appleton, Wis.	1,500	$30 and $18	....	$48 and $36
Ashland, Wis.	1,234	30 and 12	613	36 and 12
Atchison, Kan	....	24 and 12	....	24 and 12
Beatrice, Neb.	1,270	30 and 18	1,030	42 and 24
Boone, Iowa	2,400	30 and 15	1,200	36 and 18
Cadillac, Mich	1,150	24 and 18	800	24 and 12
Canton, O.	950	24 and 12	500	36 and 24
Chillicothe, O	3,000	24 and 18	1,500	24 and 18
Columbus, Ind	....	30 and 15	....	30 and 12
Crawfordsville, Ind.	1,600	27 and 12	850	30 and 18
Defiance, O	1,000	24 and 12	380	18 and 10
Delaware, O	2,450	30 and 18	425	30 and 12
Dixon, Ill.	1,500	24 and 18	150	24 and 18
Elkhart, Ind.	2,000	30 and 18	600	30 and 18
Ft. Dodge, Iowa	2,142	24 and 18	700	24 and 18
Ft. Madison, Iowa	250	24 and 12	1,300	24 and 12
Fremont, Neb.	918	30 and 12	1,000	42 and 12
Fremont, O.	1,891	30 and 18	500	24 and 18
Galion, O.	....	24 and 12	....	24 and 12
Grand Island, Neb.	525	30 and 18	1,525	42 and 30
Grand Forks, N. D.	1,500	36 and 24	1,750	36 and 30
Greensburg, Ind.	1,580	30 and 18	310	30 and 12
Huntington, W. Va	1,725	28 and 18	900	30 and 18
Hutchinson, Kan	2,000	18 and 12	2,000	18 and 12
Iowa City, Iowa	1,100	30 and 18	1,000	30 and 24
Kankakee, Ill	1,400	30 and 18	1,455	30 and 18
Kewanee, Ill.	2,100	33 and 20	734	30 and 24
Kokomo, Ind.	2,408	24 and 18	16	48 and 36
Lancaster, O.	1,600	30 and 18	....	30 and 18
Ludington, Mich	600	15 and 12	800	36 and 18
Mankato, Minn	2,000	36 and 21	838	36 and 15
Mishawaka, Ind.	800	30 and 20	100	30 and 20
Oskaloosa, Iowa	3,000	30 and 18	200	30 and 18
Ottumwa, Iowa	3,500	36 and 18	3,500	36 and 18
Princeton, Ind.	2,000	30 and 21	200	42 and 30
Sedalia, Mo.	500	24 and 18	2,150	36 and 21
Tiffin, O.	1,000	24 and 12	1,100	24 and 12
Urbana, Ill.	1,700	30 and 18	1,700	36 and 18
Vincennes, Ind.	2,000	30 and 18	1,000	36 and 18
Washington, Ind.	....	30 and 18	....	30 and 18
Webb City, Mo.	1,000	24 and 18	500	24 and 18

and Greensburg, Ind., 2 per cent. Princeton, Ind., will receive 2 per cent after 15 years of the franchise has elapsed.

The dates of present franchises are not given.

The present tendency in franchises is toward publicity of accounts and regulation of rates. This is shown to some extent in the new franchise of the Indianapolis Telephone Co., and very fully in the new franchise under discussion in Crawfordsville, which provides a form of control of service and rates based on full knowledge of the financial returns of operations. It has not been adopted by the city council, but one of the companies has agreed to accept it when it is adopted.

FROM WORKERS IN THE FIELD

Practical Points from Practical People.

Contributions to this Department are invited. Give from your experience for the benefit of others. No matter about the style of the composition, the fact is what is wanted. Use the Question Department for what you want to know; use this Department for what you can tell others.

How to Find Leakage in Water Mains and Services.

To the Editor of MUNICIPAL ENGINEERING:

Sir—Having had ten years' experience in finding leakage in water mains, I take this opportunity to extend to some of the readers of MUNICIPAL ENGINEERING the methods I employed without the use of expensive apparatus.

Leakage in water supply plants is classified as follows:

1. Loss due to pump slip.
2. Leakage in force mains.
3. Leakage in reservoirs.
4. Leakage in mains, valves and hydrants.
5. Leakage in services.
6. Leakage in houses.

As recent inquiries seem to indicate an interest in the fourth, fifth and sixth divisions, I will confine my article to these alone.

Before anything is done toward finding leakage, the extent of it must be absolutely defined. This can be done by taking daily 24-hour records over a period of two weeks at a point where the mains enter the city, by a primary meter, or at the pumping station or the reservoir. The most satisfactory way is to cut in a 6-inch meter on a by-pass permanently at the city limits. From your records you will find the time of minimum flow to be on Mondays, between 1 o'clock and 4:30 o'clock A. M. The quantity of water passing through the meter at this time can be considered a leakage, being careful to deduct from this the quantity of water being used by consumers having a known continuous flow service and paying for it.

Make an allowance of 750 gallons per mile of mains per day of 24 hours for leakage that is unprofitable to go after. The difference is the leakage you are looking for. To find this, go over your entire plant, taking one street at a time, and examine all houses, curb connections, gates, hydrants and other attachments, using the aquaphone, but do not do any digging unless the indications positively warrnat it, and stop the leakage so found. Consult your daily readings and note if any reduction in registration takes place, and if so, how much.

Assuming that you have found 50 per cent. of leakage in this manner, the balance is certain to be in the mains themselves. The method of finding this is as follows: Divide your entire plant into districts containing one mile of mains or nearly so, and control this by one valve. Tap the main on each side of the valve, and extend the ¾-inch pipes to the curb line, putting in curb cocks, and extend the line to the surface in a cast-iron manhole cover and head. This makes a permanent arrangement that is cheap, easily accessible, and will accomplish just as much as an expensive apparatus. Inside of the manhole head is room to connect a ⅝-inch straight reading meter, which is used in testing.

Having made these arrangements, you are prepared to make a test of a one-mile district. Choose a favorable night, and at 1 o'clock A. M. begin to take readings of the test meter at two-minute intervals. If the leakage is less than 4 cubic feet per hour, the mains in that district can be considered as being tight. Should the meter indicate any more than 4 cubic feet per hour, the leakage is worth while looking for. Note the amount, and go to the next district and find its condition, continuing until you have the known leakage

in all districts tabulated, and compare to the total leakage.

Now, take your worst district and go over the ground very carefully, examining all services, hydrants, valves and plumbing as before. If you do not find anything, then it is certain that the leak is underground. Take your test meter to its place and get readings again at two-minute intervals. Compare your watch with that of the man at the meter, and see that they correspond as to time. Go to the gate farthest from the meter and shut it off. Note the time. Pass to the gate next farthest from the meter, giving yourself from 15 to 20 minutes to do this, and shut it off. Note the time. Now go back to the first gate and turn it on. Then to the third gate and shut it off, noting the time in all cases. The second gate is now due to be opened, and by continuing the process you open and close all the gates in the district, and have the time at which the operation took place. While you are doing this the meter will show a falling off in its registration, and by looking at the time when it began to reduce you can tell what gate you closed. The two gates between which the leakage exists are known to a certainty.

Having thus obtained accurate information, it only remains for you to go over the ground in this section and look into water courses, under bridges, in the sewer manholes and the cellars of houses, also embankments along the road, or any low point where water would naturally find its way.

Some of these places will show more moisture than is natural to it, and it is safe to dig to the water main at a point near it, and generally you find the leak. If you find it, take readings again at night and see how much you have stopped the leakage, and if it is down to the 4 cubic feet per hour limit, go to the next district and do the same thing over again.

Sometimes you do not find leakage where you expect it ought to be. Do not let this discourage you, because you very often will find it where it ought not to be, and besides that, you have but a limited area to examine.

Look carefully into the character of the subsoil, the flow of brooks, sewers, depressions in roads, the grade of the street, changes in direction of your mains, railroad crossings, electric railroads, heavy walls, buildings, or anything that directly or indirectly would have a tendency to cause a settlement in the water mains or start a joint.

In the course of the ten years' experience in this kind of work the writer only was twice found digging up a main when no leakage existed. One leak I found came to the surface a good half mile from the source, yet two nights' testing found it. Another was in the bed of a brook, and it was found fifteen minutes after the test meter was working.

There are a few points that I want to emphasize that will help the leakage problem, and they are these:

Install a pressure-recording gauge at your office and house.

Cut in a primary meter at your city limits.

Take daily readings and not the average consumption.

Maintain a diagram showing the amount of water sent to the city, and in different colored ink show the amount of water sold to consumers.

If you do not meter the consumers, get at it.

Supply washers for faucets, and make minor repairs to plumbing gratis to your consumers. You save waste by this, and it is worth it.

Drive over your entire plant every day and use your eyes.

Attend to all the fires, if possible, and estimate the quantity of water used and note the pressure.

Look after your hydrants and valves; see that they do not leak and are in good working order.

Do not undertake to look for leakage in wet weather, nor in the winter time. It is a waste of time, and if any leaks are working they will not show at these times.

Make your tests in May, June and July, and cure all leakage found at that time. Certify this in November and in March by the primary meters.

Do not let your pressure vary more than 10 pounds between maximum and minimum flows. Cut in regulators if necessary to hold it where it belongs.

Study your local conditions as to topography and vegetation. A bunch of grass greener than another close by it has been the means of finding a leak, and a little stream of water coming down the side of the road was traced to the packing box of a valve that had been blown out. These are all simple things in themselves, but a close observation of them will justify the time employed.

Above all, do not do any digging unless you are almost certain that you are going to get what you are looking for.

When you find that 95 per cent. of the water you are supplying is being paid for by consumers, then you can sit back and keep yourself in trim for the same thing over again year after year.

The writer put in 22 hours out of 24 for a week, slept 18 hours, and did another week again before the percentage limit showed up. In this two weeks 16 leaks were found in every conceivable place, and all were cured. When some of you fellows get into this work with both feet, you will not know what day of the week it is, and your wife will be looking for a divorce. Your meals will be limited to sandwiches (egg and bacon are the best) and coffee (you can keep it hot about two hours in your breast pocket). You will appreciate more than ever the moonlight nights and the sunrises in the morning when you are out. I never saw a sunrise so glorious as

were the ones I saw after being out all night *finding* leaks in water mains, and the pen of the writer is not sufficiently eloquent to describe them, but the satisfaction of finding leakage was comparable and well worth the effort.

Any of the readers of MUNICIPAL ENGINEERING who have trouble on their minds regarding leakage in water mains will find me ready and willing to assist them gratis if they will furnish me the details and send them through MUNICIPAL ENGINEERING.

BENJAMIN L. WILLIAMS, JR.,
West Orange, N. J.

Relative Strength of Concrete of Gravel and Broken Stone.

It is ordinarily assumed, at least by the inexperienced, that the strength of concrete is measured by the proportion of cement in a given mixture relatively to the amount of the other materials—sand and stone. But the fallacy of this assumption is shown by the fact that the total volume of concrete is always less than the sum of the volumes of its ingredients. This is due to the ability of the smaller particles—the cement in a semi-liquid condition and the fine sand—to fill all interstices or "voids" between the larger pieces of stone. More compact concrete can be secured by the use of gravel than broken stone—the angular pieces of the latter frequently arch together, leaving voids to form beneath. In a technical yet very practical way this subject is discussed in a recent paper by Mr. Leonard C. Wason, of Boston, Mass. He shows that for water-tight work gravel is always to be preferred as compared with broken stone.

There is little difference in strength between concrete made by broken stone or by gravel. Mr. Wason has proved by actual test that broken stone having a rough surface with angular fractures will give an increase in strength over rough bank gravel of about 15 per cent. in most cases. In some, however, the gravel has given the greatest strength. This is always true if the stone has a glossy surface, such as is found in some trap rocks.

In the first instance, if the specifications required 1—3—6 broken stone concrete, and there is a difference in cost between broken stone and gravel screenings of 2 cents per cubic foot, it will be cheaper to use a mixture of 1—2½—5 with gravel, and still obtain an equal strength with the broken stone. Mr. Wason makes the rule never to allow the size of stone in its greatest dimensions to be more than half the thickness of the work into which the concrete is to be placed. In large size work very much larger stone can be used than is ordinarily done, with very good results, the only limitation being that of convenience in handling. In regard to placing, it is much easier to obtain dense concrete, that is, without voids, using gravel than using broken stone, as angular pieces will sometimes arch together, allowing a void to form underneath. Therefore, for water-tight work gravel is to be preferred every time. For nearly all classes of work the best results will be obtained by using such an amount of water that the concrete, when placed, will just barely quake, but is not sufficiently soft to flow.

MUNICIPAL MATTERS IN COURT

Decisions of Higher Courts—Paving Assessment Against Railroad—Public Service Commission Legal—New Orleans Water Works—Memphis Park Bonds—Rebates on Knoxville Water Bills.

Decisions of the Higher Courts of Interest to Municipalities.

BY JOSEPH W. KENNEY, ATTORNEY, INDIANAPOLIS, IND.

Opening in Sidewalk for Repairs—Liability.—If a gas company, with the knowledge and consent of a city, has discharged steam into a city sewer under a sidewalk, it is the city's duty to notify the company to stop the flow while the sidewalk is being repaired if the steam comes through the sidewalk so as to conceal the opening made therein, and also to warn pedestrians of the danger; otherwise it is primarily liable to a pedestrian injured by falling into the hole, and can not recover over against the company. (City of Bowling Green v. Bowling Green Gaslight Co. [Ky.] 112 S. W. 917.)

Water Consumer Bound to Pay Meter Rate, though Exceeding Maximum Flat Rate.—A city ordinance provided that a

water company should at no time charge consumers any rates exceeding certain rates stated; that the company might at any time insert a meter and charge meter rates, provided they should not exceed rates fixed in a following schedule, and that a consumer might set a meter and pay the rate indicated by the meter, provided the amount would exceed $12 per annum. The ordinance then provided the maximum flat rates, after which a schedule of meter rates was specified. *Held*, That where a meter was installed, the consumer was bound to pay the meter rate, provided it exceeded $12 per annum, though such rate exceed the maximum flat rate specified for the service rendered.—Charleston Light & Water Co. v. Lloyd Laundry & Shirt Mfg. Co. (S. C.), 62 S. E. 873.

Injunction to Restrain Enforcement of Ordinance.—Injunction will not lie to enjoin the enforcement of an ordinance imposing a license fee on hackmen and regulating the use of streets for public stands, which ordinance is enforceable only by a criminal prosecution.—Kissinger v. Hay (Tex.), 113 S. W. 1005.

Trees Extending Over Street.—Rev. Laws of Mass. (c. 51, sec. 10), providing that the officer having charge of trees belonging to a municipality may, and, if required by the surveyors or road commissioners, shall, trim trees, except public shade trees in towns and bushes standing in ways, etc., does not authorize a tree warden to cut down trees on private lands nor to cut off parts of such trees extending over the street.—Commonwealth v. Byard, 86 N. E. 285.

Street Railway Company to Pay City Percentage of Earnings—Valid Ordinance.—An ordinance granting to a street railway company the right to occupy the streets of the city for railway purposes, and requiring the company to pay to the city 55 per cent of the net earnings of the company during its occupation of the streets, is not invalid as making the city and the company partners in the operation of the street railway system.—Venner v. Chicago City Ry. Co. (Ill.), 86 N. E. 266.

Water Company—Supplying Water in Violation of Franchise—Action to Restrain.—A water company had the right to supply water to the public within the limits of a designated township, and a riparian owner on the stream from which the supply was taken brought a bill in equity (under Act June 19, 1871) to restrain the company from delivering water to a railroad company within the limits of the township, which company, after receiving the water, carried it in its own pipes beyond the limits of the town. *Held*, That the bill would not lie, it not being brought to inquire into the rights conferred by the charter, but into defendant's conduct under the same.—Bland v. Tipton Water Co. (Pa.), 71 A. 101.

Where a water company is supplying water in excess of the rights given by its franchise, the remedy is a proceeding at the instance of the commonwealth.—*idem.*

Regrade of Street—Condemnation Proceedings—Subsequent Assessment.—Where all special benefits to lots from the regrade of a street were offset against the damages awarded in condemnation proceedings, a subsequent assessment of benefits against the lots for the same improvement cannot be sustained on the ground that the jury in the condemnation proceedings must have taken into consideration, in awarding damages, the assessment to be thereafter levied against the lots.—Schuchard v. City of Seattle (Wash.), 97 P. 1106.

Appropriation of Street to Additional Use—Compensation.—Additional railroad tracks laid in the street entitle the abutting property owner to additional damages when they are not provided for or contemplated at the time of the original assessment of damages.—Henry v. Mason City & Ft. D. R. Co. (Iowa), 118 N. W. 310.

Assessment—Benefit to Property—Notice.—The fundamental fact upon which the validity of a special assessment rests is an increment of benefit to the property taxed for an improvement, and the property owner must have notice of an opportunity to be heard, or the equivalent thereof, before a special assessment can become a valid charge against him.—Union Pac. Ry. Co. v. City of Abilene (Kans.), 98 P. 224.

Assessments—Front-foot Rule—Proportionate Benefit to Abutting Lots.—The Code of Iowa, sec. 818, when adopted, provided that the cost of making any street improvement should be assessed against the abutting property in proportion by the front-foot rule. The Acts of General Assembly, 1900 (Code Supp., sec. 792a), provide that special assessments shall be in proportion to the special benefits conferred. *Held*, That the basis of the assessment is the proportionate benefit to the abutting lots, though in the absence of any other consideration affecting the benefits, the frontage may be properly considered as the basis for determining such benefits.—Des Moines Union Ry. Co. v. City of Des Moines, 118 N. W. 293.

City Officer—Violation of Duty—Penalty.—The Code of Mississippi, 1906, sec. 1302, provides that if any person, being an officer of any city, shall knowingly or wilfully neglect or refuse to perform any of the duties required of him by law, or shall violate his duty in any respect, etc., he shall on conviction be fined not exceeding $1,000, or be imprisoned in the county jail not exceeding six months, or both. *Held*, That where the mayor and aldermen of a city failed to give notice of an election to determine the question whether there should be an increase in taxation for a specified year, as required by sec. 3430, they were subject to indictment under sec. 1302, though the only penalty prescribed

by sec. 3430 was removal from office.—State v. Glennen, 47 So. 550.

City's Lease of Land Without Reappraisement.—New York city may not defeat an action for specific performance of a contract to lease land because the sinking fund commissioners did not have the land reappraised after amending the resolution ordering the sale so as to eliminate a provision authorizing the city to cancel the lease at any time, since under Greater New York Charter, Laws 1901 (p. 79, c. 466, sec. 205), authorizing the commissioners to lease property after appraisal, etc., it was discretionary with them whether any appraisal should be made, and since a city may not repudiate a contract upon technical omissions to perform collateral acts not of the substance of the power exercised or jurisdictional in character.—Brown v. City of New York, 112 N. Y. S. 1123.

Purchase by City Exceeding Limit Prescribed by Constitution—Sellers' Enforcement of Lien.—Where a city has bought an engine which it had the power to purchase, except that its debt already exceeded the limit fixed by Const., sec. 158, and, as between it and the seller the latter under its contract has a lien on the engine for the deferred payment, the city, which will not and can not be compelled to pay, may not, though using the engine as part of the electric light plant, retain it and give the seller the option merely to rescind the contract and return the partial payment made, but the seller may enforce his lien by sale.—City of Bardwell v. Southern Engine and Boiler Works (Ky.), 113 S. W. 97.

Defaulting Public Officer—City No Priority.—Cities are not entitled to priorities over other creditors of a defaulting public officer in the collection of claims on his bond.—U. S. Fidelity and Guaranty Co. v. Rainey (Tenn.), 113 S. W. 897.

Legislature's Power Over Municipal Corporations.—The Legislature has plenary power over all municipal corporations and their officers and their public revenues, and the municipality can not complain of any act of the Legislature diminishing its revenues, amending its charter, or dissolving it entirely.—McSurely v. McGrew (Iowa), 118 N. W. 415.

Right of Private Citizen Against Municipal Corporation.—Under the guise of legislative control of municipal corporations, a private citizen can not be deprived by an act of the Legislature of any of his rights against a municipal corporation.—(Idem.)

Initiative and Referendum in City Government.—The provision in Statutes 1908 (p. 542, c. 574) amending the charter of the city of Haverhill, which provides for the initiative and referendum in the adoption of ordinances, is not unconstitutional; for the Constitution, forbidding the initiative and referendum in general legislation, does not extend to the making of ordinances by cities, under the authority of the Legislature as to subjects of local concern, and whether such legislation shall be inaugurated by the people or by a representative body or board of officers is for the Legislature to determine.—Graham v. Roberts (Mass.), 85 N. E. 1009.

Public Improvement Without Notice to Owner of Land.—Where a public improvement is made without notice, actual or constructive, to the owner of land specially benefitted, of the intent to make such improvement, he can not be assessed for special benefits, unless he has waived his right to a hearing.—Walsh v. City of Newark (N. J.), 71 A. 39.

Unauthorized Act of Engineer Not Binding Upon Town.—The authority of an engineer, acting for a town under a contract for the construction of a waterworks system, being prescribed by the contract, the contractor was bound to know that any unauthorized act of the engineer would not bind the town; i. e., the acceptance of materials or work not complying with the contract. Such acceptance can not preclude the town from relying on a breach of the contract.—Town of Sterling v. Hurd (Colo.), 98 P. 174.

Street Improvements—Paving—Petition of Property Owners.—Under the Milwaukee city charter the cost of paving and of repaving a street is chargeable against the abutting property until the limit of $3 per square yard is reached. Sec. 6 of the same chapter authorizes the board of public works, in conjunction with the city council, to pave a street without a petition from the property owners, provided the proceedings in reference thereto are carried on in the manner prescribed. *Held*, That the board and city council have authority to order a street paved without a petition from the property owners, and to assess the cost thereof within the prescribed limits against abutting property.—Loewenbach v. City of Milwaukee et al., Supreme Ct. of Wisconsin, Feb. 16, 1909.

Letting of Contracts Without Bids.—Sec. 921, Statutes of 1898, requiring contracts for the performance of work in a village, exceeding $50, to be let to the lowest bidder, does not prevent the repair of highways without bids, by the employment of men and teams by day's work, though the total expense of the entire work may exceed $50.—State v. Wallschlaeger (Wis.), 118 N. W. 643.

Sweeping Decision on Paving Assessment Against Railroad.

The supreme court of New Jersey held, in an opinion handed down April 3, setting aside the assessment for benefits levied by the city of Newark against the New York Bay Railroad Company for the paving of Hillside avenue, that a railroad's right of way is regarded, for such purposes, as land permanently devoted to public uses. Hence, it is ruled that benefits to the land in such use, not the enhancement of its market value, is the proper basis of its

assessment. Where no such benefit accrues no assessment can be imposed.

Justice Garrison, who wrote the opinion, points out that the tracks at the point in question are used for freight trains, and there is no station at or near the intersection of Peddie street and Hillside avenue. There is no evidence, under the circumstances, that the paving of Hillside avenue is of benefit to the land of the railroad in its present and presumably permanent use.

New York Public Service Commission Law Is Constitutional.

The New York supreme court has rendered a decision holding that the Public Service Commission law is constitutional and that the Economic Power and Construction Company of Buffalo is under the jurisdiction of the second district commission and must make reports to it.

The Public Service Commission brought action against the company for the payment of penalties for failure to file reports with the commission. The company demurred to the complaint and contended that the Public Service Commission law was unconstitutional; that the company was organized under a special legislative act which gave it sweeping powers, and it consequently was not under the jurisdiction of the commission.

The company is liable to fines at the rate of $100 a day, or a total maximum fine of $23,500. It is not believed the full penalty will be imposed, as the amount of money involved was looked upon as a secondary matter, the question as to the company being compelled to report to the commission being more important.

The company will appeal.

New Orleans Water Works Litigation.

In an opinion handed down April 15, by Judge Boarman of the Federal circuit court, he made permanent the temporary restraining order granted April 12 to the New Orleans Water Works Company to restrain the Sewerage and Water board from violation of its contract with the water works company. In announcing his decision, Judge Boarman said that the petition of the plaintiff charged that the defendant was now using property of the plaintiff and that admission of this charge had been made by the defendant. In the opinion of the court, this act alone, putting aside the question of the contract which the defense held to be ultra vires, should constitute a ground for injunction.

With reference to the contract itself, however, which provides that the Sewerage and Water board shall have use of the pipes of the water works company, in return for which use it is to supply water to consumers of the old company, and to turn over to the old company a per cent of the revenue therefrom until such time as the connections have been made with the mains of the Sewerage and Water Board, the court held that the Board has the right to make such a contract. The ruling in this regard was given on the ground that the law creating the Sewerage and Water Board provides that the Board shall not have authority to acquire property, except by ratification of the City Council, but that it does not provide that the Board shall not exercise implied rights and under such rights lease property necessary for the furtherance of its service. In the case at issue the court held that the Sewerage and Water Board had not acquired property in the sight of the law, but had obtained the use of certain property, and that under implied rights it had the right to make a contract for such use.

Taking this view of the case, the court held that an injunction should be granted to the plaintiff and therefore ordered that the temporary restraining order, already issued, should be made permanent.

Memphis Park Bonds Valid.

An opinion delivered by Judge Dillon holds that the recent park bond issue amounting to $1,000,000, at Memphis, Tennessee, is a safe and valid issue, and that the act under which the board of park commissioners is authorized to sell such bonds is in perfect accord with the constitution of the state of Tennessee.

Collection of Rebates on Water Bills in Knoxville.

A bill was filed in chancery court by a number of citizens of Knoxville, Tennessee, March 30, who are seeking to collect rebates alleged to be due them as consumers of water furnished by the Knoxville Water Company. It is estimated that about $173,000 is payable to consumers. An injunction is asked for restraining the Knoxville Water Company from removing to Boston, its main office, funds collected in the city of Knoxville, and that a receiver be appointed to take charge of the funds collected by the company, and an attachment issue on the plant of the company, which it is alleged is now negotiating a sale with the city of Knoxville.

The water commission and special committee of the city council of Knoxville are urging the city to take steps to purchase the present plant of the Knoxville Water company.

Water Supply for Staten Island.

Prevented by law from diverting potable water outside of the State of New Jersey, and failing in its efforts to lease, on its own terms, Newark's driven wells at Belleville, the Hudson County Water Company is engaged in constructing a driven well plant of its own in Belleville township, in a last effort to fulfill its contract to furnish a supply of potable water from New Jersey for Staten Island. The property where the wells are being sunk directly adjoins the old Newark water works, and comprises about six acres.

CURRENT INFORMATION

Water Purification in New Jersey — Water Supply of Charleston — Sewage Purification in Orange—Highways About Baltimore—Williamsport Public Work—Bridges—California For Good Roads—Sidewalks in Des Moines

New Jersey Cities Can Erect Water Purifying Plants.

The New Jersey legislature passed a bill April 1 to permit a city, upon certificate of the local board of health that it is necessary to purify and filter its water supply, to construct a purification and filtration plant, and issue bonds to pay for the same.

Water Works Improvements in Charleston, S. C.

The city council of Charleston, S. C., agreed, recently, to the extension of the water mains in various sections of that city, with the abolition of the "dead ends" in the extreme eastern section which have interfered with the work of the fire department on several occasions. It also accepted and confirmed the report of the committee on water supply, and decided again not to take over the cost of the erection and maintenance of the hydrants of the corporations. Besides settling the question of the water main extension and the establishment of hydrants, city council ratified the ordinance requiring all city institutions to buy their supplies on a strictly competitive bid system.

Proposed Sewage Purification Process in Orange, N. J.

The special sewer committee of Orange, New Jersey, has under consideration a proposition made by the Gerard Ozone Process Company, of New York, providing for the treatment of sewage matter, which, it claims, will prevent any possible pollution of the stream into which it flows. The company offered to erect an experimental plant which would be operated by the concern until the citizens of Orange are convinced that the ozone method of treating sewage is practicable.

Highways About Baltimore, Md.

In his annual report to the Baltimore County Highways Commission and the Maryland Geological Survey, Henry G. Shirley, roads engineer of the county at Baltimore, Maryland, said that last year 43 new bridges were built at a cost of $24,407.82, of which 24 were concrete and reinforced concrete, 3 of stone, and 16 of wood. During the last four years 177 bridges have been built, of which 19 are of steel, 56 of wood, and 102 of concrete, reinforced concrete, and stone. The county erected 84 of these bridges, and the highways division of the Maryland Geological Survey erected 18 under the State Aid law. Previous to this date there were but 2 reinforced concrete bridges in the county. Engineer Shirley feels gratified that the highways commission has adopted his previous recommendations, and trusts that they may increase the number of permanent bridges each year until all the bridges of the county have been replaced with substantial, permanent structures.

Public Work in Williamsport, Pa.

In his annual report, city engineer Fisher, of Williamsport, Pennsylvania, makes no special recommendations, but discusses in a general way a number of matters, and calls attention to improvements that might be made along certain lines. These include the conditions regarding construction of buildings, their safety, etc., the extension of the fire limits, cutting holes in paved streets, and the sewage disposal proposition.

During the last year more than 2 miles of sewers were constructed and 13,000 square yards of paving laid.

Concrete Bridges.

A new book on "Concrete Bridges and Structures" is coming from the press as this number of MUNICIPAL ENGINEERING is issued. It is by H. G. Tyrrell, of Evanston, Ill., and gives in concise and practical form the most approved methods of design and construction of concrete bridges, and an example of the solution in detail of a concrete arch bridge, also a table of existing arches, with halftone illustrations. A second part treats of trestles and culverts. The book contains thirty original tables and drawings, and upwards of 900 separate estimates for concrete structures of various sizes and forms, also beam and slab tables, and charts of comparative costs. The book costs $2.50. Fuller notice will appear later.

Good Roads Wanted in California.

Gov. Gillett is trying to have a measure passed that will provide a fund to establish state roads connecting all important points in California. The measure proposed is a good one and it should pass, as originally drafted and without amendment. It provides that $18,000,000 be laid

aside for road construction. This road construction will in no way interfere with the mud hillocks being put up as roads by the various counties, but it may act as an example of what good road building should be, for the intention is to import the services of a United States expert in roads and have him coach the builders as to the best use to be made of the local materials.

In a recently published pamphlet, issued on the subject of good roads, it is reported that in one of the central counties of California the sum of $525,000 was expended by the road, or county, commissioners in one year, and the further statement is made that this particular county has no roads worth the name. It must be remembered also that immense sums of money had preceded the amount mentioned. This is true of one county, and it may be said that it is practically true of all the counties in the state.

Many Sidewalks for Des Moines.

A suggestion was made in the council chamber, at Des Moines, Iowa, April 5, that the city have a "sidewalk day," and everybody lay sidewalks. The council had had under consideration 134 resolutions for the construction of sidewalks in all parts of the city, aggregating a total of 12 miles.

ORGANIZATIONS AND INDIVIDUALS

Association for Testing Materials — Society of Engineering Contractors — Chicago Cement Show — Summer Schools of Engineering — Technical Meetings — E. A. Kingsley — A. L. Barber — F. A. W. Davis — Andrew Rosewater — Elections of Mayors — Elections of City Officers — Civil Service — Personal Notes.

International Association for Testing Materials.

The fifth Congress of the International Association for Testing Materials will be held in Copenhagen, September 7 to 11, inclusive. The meetings will be followed by technical excursions. American members will be interested in the appointment of Prof. A. N. Talbot, of Urbana, Ill., as new vice-chairman of the committee on Problem 41 (iron concrete), and Prof. F. E. Turneaure, of Madison, Wis., as a member of the commission. Both are members of the committee on concrete and reinforced concrete in this country. Prof. F. Schule, of Zurich, has also been appointed chairman of this same commission to take the place of Mr. Considere, resigned, but who remains a member of the commission.

Under "Concrete, Hydraulic Cements, Stones," the principal questions to be first discussed at the Copenhagen Congress are as follows:

Reinforced concrete. Prof. F. Schule, Zurich.

Progress in the methods of testing. Mr. R. Feret, Boulogne s. M.

Cement in sea-water, Prof. A. Baykoff and Mr. W. Czarnomsky, St. Petersburg.

Constancy of volume. Mr. B. Blount, London.

Tests by means of prisms and standard sand. Prof. F. Schule, Zurich.

Weathering resistance of building stones. Prof. A. Hanisch, Vienna.

The Society of Engineering Contractors.

The American Society of Engineering Contractors was formed in New York in April, and elected the following officers: President, George W. Jackson, of Chicago; first vice-president, Halbert P. Gillette, of New York; second vice-president, Daniel E. Baxter, New York; three members of the board of directors to serve one year, E. Wegmann, of New York; DeWitt V. Moore, of Indianapolis, and W. D. Lockwood, New York; directors for two years, George C. Warren, of Boston; E. S. Hanson, of Chicago, and J. R. Wemlinger, of New York; directors for three years, Major Cassius E. Gillette, of Philadelphia; F. C. Hitchcock, of New York, and Howard J. Cole, of Morristown, N. J.

The constitution states the object of the society to be:

The advancement of engineering knowledge and contracting practice; the maintenance of a high professional standard among its members; the elimination of such undesirable practices and abuses as

now exist in the engineering and contracting business, and the strengthening of the bond that should exist between engineers and contractors.

The constitution provides for two classes of membership. Corporate members must either be engineers, contractors or manufacturers of engineering materials or equipment, who have had at least seven years' experience in these lines of business, although graduation from an engineering college of standing is considered as two years of experience. An associate member may be any person who is interested in or engaged in engineering construction and has reached the age of eighteen. However, if he cannot qualify as a corporate member within seven years, his name is dropped from the rolls. Only corporate members have the right to vote and hold office.

The Chicago Cement Show.

At a recent meeting of the executive committee of the Illinois Society of Municipal Contractors it was decided to hold their next annual convention in the city of Chicago during the third annual cement show. This step was taken with the idea in view of permitting the members of the association who will attend the convention to also visit the cement show.

The Chicago Cement Show is rapidly making its importance felt throughout the country, and this is an indication of the attraction it has become for organizations of engineers, contractors and technical bodies.

It is reported that several other organizations also contemplate holding their next annual meetings in Chicago simultaneously with the cement show.

Extensive preparations for the event are already in progress, which promise an exhibition even more remarkable than the successful show held last February.

The exhibition will again be held in the Coliseum, on February 17 to 23, 1910. These dates were selected after very careful consideration and in accordance with the expressed wishes of a very large majority of the exhibitors at the two previous exhibitions. The show this year proved conclusively that the latter part of February is the most satisfactory time for holding a cement show.

Summer Schools of Engineering.

The circular of the Wisconsin University summer session, Madison, Wis., shows numerous subjects of interest to the young engineer. Among the strictly technical courses are five in surveying, five in electrical engineering, two in experimental hydraulics, one in sewage disposal, eight in steam and gas engineering, three in machine design, three in mechanical drawing, four in applied mechanics. There is also a series of courses for apprentices and artisans.

The University of Illinois, Urbana, Ill., and Purdue University, Lafayette, Ind., also offer numerous summer courses to those desiring to gain some engineering knowledge.

Technical Meetings.

The object of the National Highways Protective Society of New York City, which was incorporated March 30, is to prevent the improper or unreasonable use of the public highways by owners of vehicles, including automobiles; to secure the construction of good roads, and to endeavor to bring about reasonable and uniform rules and regulations for the use of highways throughout the United States. The directors of the society are Lawson Purdy, Gilford Hurry, George W. Burleigh, Joseph H. Colt, Edward Shelton Cornell, Milton I. D. Einstein, William H. Llewellyn, A. D. Middleton and J. Forbes Potter, of New York City.

The forty-first annual convention of the American Society of Civil Engineers will be held at the Mount Washington hotel, Bretton Woods, N. H., July 6 to 9, 1909. Topics for discussion received from members before May 20 will be placed on the program in reasonable number. For accommodations address W. S. Kenney, 1180 Broadway, N. Y., until June 1, later at the hotel.

At the meeting of the New York Electrical Society, April 29, B. A. Behrend gave a lecture on the design and characteristics of modern electric machinery. The meeting of March 31 was held at the New York Hippodrome on the stage after the performance had been witnessed, and the electrical equipment and methods of obtaining the light effects were explained by Arthur Williams.

The informal library talk of the Brooklyn Engineers' Club on May 6 will be by Henry R. Cobleigh on the oxy-acetylene welding process, with lantern slides and experiments.

A notable public health conference was held at the University of Illinois beginning April 23, all public health officers and others interested being invited. The moving cause of the conference was a series of six lectures delivered during the week by Prof. W. T. Sedgwick, of the Massachusetts State Board of Health, on science in the service of public health, under the heads of (1) biology, including laboratory, microscopical examinations of milk and food supply; (2) medicine, study of trichoosis, typhoid fever, Asiatic cholera, toxins and antitoxins and vaccination; (3) chemistry, early theories of fermentation, gas supply and public health, sewer gas, ventilation and water and sewage; (4) engineering, modern water supply, modern sanitary engineering, water sheds, sand filters, disposal of garbage; (5) statistics, comparative mortality as to science, mortality from disease, occupational diseases; (6) education and government, hygiene and sanitation in the public schools and col-

leges and universities, federal bureau of public health, state board of health.

At the meeting of the Municipal Engineers of the City of New York, held April 28, Charles W. Leavitt, Jr., landscape engineer, presented a paper on "Improvements of the Appearance of Municipalities."

The thirty-second convention of the National Electric Light Association will be held at Atlantic City, N. J., June 1, 2, 3 and 4.

The next meeting of the American Water Works Association will be held at Milwaukee, Wis., June 6 to 12.

The annual convention of the National Fire Protection Association will be held in New York City, May 25, 26 and 27. W. H. Merrill, 382 Ohio street, Chicago, secretary.

The annual convention of the National Electric Light Association will be held at Atlantic City, N. J., June 1, 2, 3, and 4. W. W. Freeman, secretary, 29 West Thirty-ninth street, New York City.

The annual convention of the American Society for Testing Materials will be held at Atlantic City, N. J., June 29, 30, July 1, 2 and 3. Edgar Marburg, secretary, University of Pennsylvania, Philadelphia.

The Cornell Society of Civil Engineers is an outgrowth of the organization of New York engineers who attended the school of engineering of Cornell University. Its object is the supply of assistance of any required nature to the school and to its alumni. H. G. Balcom, 314 Madison avenue, is the corresponding secretary.

At a recent conference of water works men held at the University of Illinois, the Illinois Water Supply Association was formed. The papers presented at the conference will be printed in a volume of proceedings, which will be exchanged with the members of the Indiana Water Works Association and the Illinois Society of Engineers and Surveyors. Many of the prominent water works officials in the state have already joined the association. The officers include Dabney H. Maury, president, consulting engineer, Peoria; C. E. Slocum, superintendent water works, Belleville, Owen T. Smith, superintendent and secretary Freeport water works, Freeport, R. R. Parkin, superintendent water department, Elgin, vice-presidents; Edward Bartow, secretary-treasurer, director State Water Survey, University of Illinois, Urbana, Ill.

The Permanent International Association of Navigation Congresses has established the offices of the executive committee and the general secretary, Alexis Dufourny, at 38 Rue de Louvain, Brussels, Belgium. M. Dufourny is the chief engineer of the director of bridges and roads of Belgium. The chairman of the American section is Brig. Gen. C. W. Raymond, and the disbursing officer is Lt. Col. J. C. Sanford, Newport, R. I., to whom membership fees of $2 a year are payable.

The Argentine Republic will held an International Exhibition of Railways and Land Transport at Buenos Aires, from May to November, 1910. The program has been issued, and shows a thorough classification and complete covering of the field. It is under the direction of the director general of railroads in Argentina, Alberto Schneidewind, from whom full information can be obtained, and is held in honor of the hundredth anniversary of the independence of the Republic.

Before the meeting of the Illinois Gas Association, held in Chicago, March 17, 1909, Henry I. Lea read a paper on "A New Method of Gas Manufacture," in which he showed the results that may be expected from the continuous manufacture of a gaseous mixture composed of producer gas and hydrocarbons from oils or solids and products of combustion of producer gas. The paper has been printed, and copies can probably be obtained from Mr. Lea, consulting gas engineer, The Rookery, Chicago.

Lehigh University grants the degree of C. E. to forty-three graduates this year. The importance of concrete in the course is indicated by the fact that twenty-one of the theses are upon concrete and at least five others are in part upon this subject.

The Cleveland Industrial Exposition will be held in Cleveland, Ohio, June 7 to 19, under the auspices of the Chamber of Commerce. Nearly 300 exhibits of Cleveland manufacturers have been arranged.

The Merchants' Association of New York issues its eleventh year book from its new home, 54-60 Lafayette street.

The special committee of the Union of Canadian Municipalities on uniform municipal accounting have printed a draft of the report which they propose to present at the convention of the Union next summer. The report suggests a classification of accounts for general adoption, including (1) a general classification of services, (2) cash balances and investment fund balances, sinking funds, (3) obligations contracted during the year, (4) indebtedness, (5) indebtedness at close of year, (6) licenses and fees, (7) statement of assets and liabilities, (8) general statistics. Copies of the report can be obtained of G. S. Wilson, 107 St. James street, Montreal, Que., and suggestions of improvements are requested.

The League of American Municipalities will hold its thirteenth annual convention in Montreal, Que., August 25, 26 and 27. John MacVicar, secretary and treasurer, Des Moines, Iowa, will give information about the program from time to time as it is ready for distribution.

A conference on the needs of the state of Illinois in out-of-door improvement for the home and the municipality was held at the University of Illinois, March 31.

A lecture on the Panama canal before the Commercial Club of Boston by Philippe Bunau-Varilla has been published as a document, with some additional evidence to sustain the argument against a lock canal and in favor of a sea-level canal.

E. A. Kingsley.

The new city council of Little Rock, Ark., has re-elected E. A. Kingsley to act as superintendent of public works for another term of two years.

Superintendent of Public Works Kingsley has been in the employ of the city since 1904, leaving the engineering department of the Rock Island, with which he had been for a number of years. He is a graduate of the engineering department of Purdue University, Lafayette, Ind. During his term of office Superintendent Kingsley has prepared the plans and acted as engineer for the majority of the improvement districts in the city. He has really promoted the most of the districts, starting the petitions which resulted in so many paved districts for the city. He is in a large measure responsible for the spirit of progress that has prevailed in recent years.

E. A. KINGSLEY,
Superintendent of Public Works,
Little Rock, Ark.

Superintendent Kingsley says he will continue his crusade for more paved streets and sewers during his new term of office, and expects in this time to add not only many miles of paved streets, but a storm sewer system as well. He has set a high standard for the advancement of the city's material interests, and has shown that he can maintain it.

Mr. Kingsley is vice-president of the American Society of Municipal Improvements, and, on his invitation, the society will meet in Little Rock next November.

Amzi L. Barber.

Amzi Lorenzo Barber, president of the A. L. Barber Asphalt Company, died April 17 at his home, Ardsley Towers, in Ardsley, N. Y., of pneumonia. He was in his sixty-sixth year, and was ill only a few days. He had returned about a week before from a trip to California, where he had spent a month, partly for his health, and partly to inspect asphalt properties.

Mr. Barber was identified with the asphalt industry, and his career is bound up with the introduction of that material as a pavement and the political and commercial complications which have resulted from its exploitation.

He was a descendant of an old American family. His father, the Rev. Amzi Doolittle Barber, was pastor of the Congregational Church at Saxton's River, Windham county, Vermont. There Amzi L. Barber was born in 1843, but he spent his early years in Ohio, and graduated from Oberlin College in 1867, and took a post-graduate course in theology, but was induced by Gen. O. O. Howard to take charge of the normal department of Howard University, where he filled several positions, till in 1872 he abandoned teaching for a business career.

At first he took up real estate, and laid the foundation of his fortune. It was the inquiry conducted by the United States government into the best methods of paving the streets of the capital which turned his attention to asphalt. Pennsylvania avenue was to be improved, and it was decided that the best material was asphalt, in 1876 an entire novelty. Mr. Barber watched its success, and saw immense possibilities in its development, and two years later forsook real estate for asphalt pavements, forming A. L. Barber & Co., in 1883 incorporated as the Barber Asphalt Paving Company.

He obtained his raw materials from the Pitch Lake in the British island of Trinidad. At this time it was leased out to a number of small pitch farmers, with the exception of five acres which were retained by the government for its own use. Mr. Barber, in dealing with these lease-holders, became equally interested with them in what they considered a grave injustice on the part of the government.

Pitch from the rest of the lake filled excavations made in the government's section. A suit to restrain this despoliation of the lake was begun by the lease-holders. It was carried to the Privy Council in London, the highest court of the British Empire, and was decided in 1886 in favor of the colonial government. Mr. Barber then stepped into the breach, and, acting unaided, carried on negotiations for two years with the crown and island authorities. The result was that he undertook to buy out all the small pitch lease-holders, and on February 1, 1888, secured a concession for the entire Pitch Lake to the Trinidad Asphalt Company, which he had

formed for the purpose. The concession was for twenty-one years, but soon afterward its term was doubled.

By this means Mr. Barber was at the head of two concerns. The Barber Asphalt Paving Company bought its pitch from the Trinidad Asphalt Company, manufactured it into paving material, and sold the finished product. The headquarters of the Barber Asphalt Paving Company were in 1888 moved from Washington to New

A. L. BARBER.

York in order to be nearer to the center of commerce, and ten years later, in order to avoid prejudice against an American corporation doing extensive business in England, a British corporation was formed, the New Trinidad Lake Asphalt Company, Limited, of London, which took over the Trinidad Asphalt Company.

Meanwhile, in 1894 the Trinidad Asphalt Company had acquired the New York and Bermudez Company. The backers of this concern had been hit hard by the panic of 1893, and Mr. Barber and his associates were able to acquire the property on favorable terms. Five years later Elkins and Widener, of Philadelphia, determined to form an asphalt combination. They were interested in the companies in which Mr. Barber was interested. These and sixty-eight other companies were taken into the combine, which received the name of the Asphalt Company of America. Mr. Barber was not in favor of this combination, and voted against it.

A year later Mr. Widener and his friends lost control to John M. Mack, who formed the National Asphalt Company of America, which took over the control of the original trust. On January 3, 1901, he sold his holdings and retired from the asphalt business. A year later the trust went into bankruptcy under the weight of the small concerns which had been taken into it, and on its reorganization in 1903, as the General Asphalt Company, it consisted only of the Barber Asphalt Paving Company, the New Trinidad Lake Asphalt Company, Limited, and the New York and Bermudez Company, which had been Mr. Barber's contributions to the combine.

Mr. Barber's return to the asphalt business came in 1904 through the trouble which the New York and Bermudez Company got into with President Castro, of Venezuela. It was proven that the concern had contributed $145,000 to the Matos revolt, which cost the Venezuelan government 12,000 lives and took eighteen months to subdue. The property of the company was sequestered, and the Federal High Court appointed Ambrose H. Carner, who died three months ago, receiver. He had to find a market for his pitch, and he appointed Mr. Barber his agent in this country. To do this Mr. Barber organized the A. L. Barber Asphalt Company.

In 1907 the charges against the Bermudez Company were settled by a decree of the highest Venezuelan court ordering it to pay of fine of $5,000,000. Execution was not enforced, owing to the intervention of the State Department of the United States. Things stayed as they were until Castro departed last year for Europe and Gomez seized the government, and asked the United States to send a commissioner to settle the dispute with Americans. Washington dispatched Commissioner William I. Buchanan and three ships, and on February 13 the $5,000,000 claim of the Venezuelan government was compromised for $60,000, the property was returned to the asphalt trust, and Mr. Barber found himself cut off from the source of supply of pitch for the A. L. Barber Asphalt Company. It was party to find other supplies of pitch that he took the trip to California.

Before Mr. Barber's last illness he took much interest in the improvement of country roads, and it became his ambition to extend to them a modification of the pavement used on city streets. He was planning a campaign to push this use of asphalt at the time of his death.

Besides asphalt, Mr. Barber was greatly interested in automobiles. He was one of the first to take up the business seriously, as he formed the Locomobile Company of America in 1898.

Mr. Barber was a great yachtsman, and his yacht, the Sapphire, was sold to the government at the time of the Spanish war, and has since won fame as the Yankton, the tender of the fleet on its voyage round the world.

He was also the first American to apply the Parsons turbine to a yacht. In 1902 he had the Lorena built and fitted with this type of engine. In 1906 he sold her to George J. Gould, who rechristened her the Atalanta.

The Ardsley Club was founded by Mr. Barber.

Mr. Barber was twice married, first to

Miss Celia M. Bradley, of Geneva, Ohio, who died in 1870. His second wife was Miss Julia Langdon, a daughter of J. Le Droit Langdon, of Belmont, N. Y.

Frederick A. W. Davis.

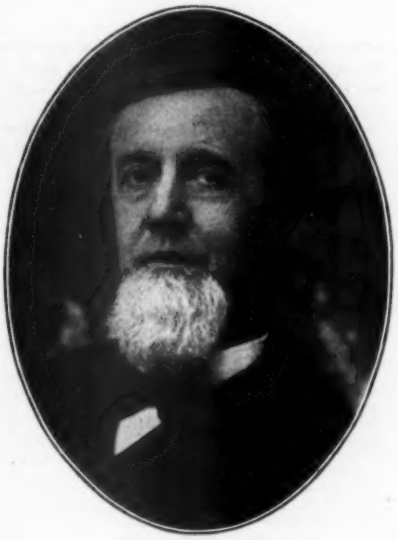
Frederick A. W. Davis, president and treasurer of the Indianapolis Water Company, died on April 9, at the residence of his son at Pelham, New York, of pneumonia and heart trouble, after about three weeks' illness.

Mr. Davis was born September 24, 1836, at Jackson, Mo., and came to Indianapolis in 1852, a boy seeking employment. His first ambition was to become a machinist, but he was unable to find that kind of work. He accepted employment as clerk in the store of John M. Talbott, one of the then prominent Indianapolis stores, in which place he was employed for some time. He left this store to take up bank work, and continued in this line, in various capacities, for quite a number of years. During the civil war he, as officer of one of the banks, handled all of the money with which the Indiana soldiers were paid, and was instrumental in maintaining the credit of the state during the war times. From 1865 to 1881 he was cashier of the Indiana Banking Company, and his connection with the Indianapolis Water Company began in 1881, and was brought about by the relation he had borne to the banking company. Among the assets of that company were considerable stock in the water company and some of its bonds. These were turned over to Mr. Davis, that he might do with them the best that was possible for the creditors of the bank. He became vice-president and treasurer of the water company, which had been in serious financial condition, and continued in these capacities until five years ago, when he was elected president, to succeed the late Gen. Thomas A. Morris. He was also at that time re-elected treasurer, and held these positions at the time of his death. Mr. Davis became a recognized authority on all matters pertaining to water works, and his advice was sought by a large number of water works plants throughout the country.

The relations of Mr. Davis and MUNICIPAL ENGINEERING have always been very cordial, and he has often shown it unusual courtesies. During the time that he was president of the American Water Works Association this magazine conducted a competition among water works officials with regard to methods of accounting. Mr. Davis very kindly acted as one of the committee of experts to examine the documents submitted and to award the prizes. From the results of this competition was developed the American water works bookkeeping system.

Mr. Davis was active in the work of protecting the purity of the water supplies of the state of Indiana, and the present excellent law in that state undoubtely owed much of the ease with which it passed the last legislature to the work done during the past years by Mr. Davis and his colleagues.

While a man slight of frame, and not constitutionally strong, his energy was the wonder of all who knew him, and his application to business left him no time for recreation. In everything that in any way touched the business or operation of the



F. A. W. DAVIS.

company he gave himself the familiarity of an expert.

Besides Mr. Davis's membership in the American Water Works Association above referred to, he was an active member of the New England Water Works Association, the National Conservation Commission, the Lakes-to-the-Gulf Deep Waterway Association, the Indiana Engineering Society, and kindred associations.

Andrew Rosewater.

Andrew Rosewater, who has been city engineer of Omaha, Neb., so frequently since 1870 that he is best known by that designation, died suddenly of heart disease on April 17. Mr. Rosewater was born in Bohemia in 1848, was educated in Cleveland, O., and went to Omaha in 1868, after four years' work in the engineering corps of the Union Pacific railroad. He began as assistant city engineer and became city engineer in 1870. So far as the records at hand show, he was city engineer from 1870 to 1876, again from 1881 to 1887, again in 1893 to 1895, and from 1897 to the date of his death, much of this latter period being also, ex-officio, president of the board of public works. In the intervals Mr. Rosewater was engineer on the Omaha & Northwestern railroad, the Omaha water works,

was president of the electrical subway commission of Washington, D. C., and consulting, designing or constructing engineer for sewer systems in twenty-five or thirty cities.

At all times he has been called on for consultation in municipal improvement problems, and he has been for several years consulting engineer for Chicago on asphalt pavement design, construction, inspection and repair.

Andrew Rosewater, like his brother, the well-known editor of the Omaha *Bee*, who died some three years ago, was noted for his energy and progressive spirit, and his rise from his position as a boy on a railroad engineering corps to that of one of the best known municipal engineers in the country, without the usual technical training, was due to these characteristics.

Elections of Mayors.

Mayors were elected and re-elected during April as follows:

Michigan—
- St. Louis—John Burns.
- Bay City—E. E. Evans.
- Tawas City—Frank S. Taylor.
- East Tawas—James Labarde.
- Bessemer—Andrew Bayrne.
- Joseph—Irving W. Allen.
- Sandusky—Edgerton Proctor.
- Marine City—S. C. McLouth.
- St. Clair—Theodore Ruff.
- Marshall—E. C. Sawdy.
- Battle Creek—John W. Bailey.
- Ionia—R. L. Readermisjy.
- Sault Ste. Marie—F. P. Sullivan.
- Charlevoix—O. F. Wilbur.
- Monroe—Jacob Martin.
- Harbor Springs—James Caskey.
- Ann Arbor—William Walzem.
- Stanton—Morris W. Stevenson.
- Petoskey—John P. Reycraft.
- Eaton Rapids—B. H. Custer.
- Allegan—Gustav Stern.
- St. Johns—Fred W. Goodes.
- Ludington—Charles E. Cartier.
- Big Rapids—A. V. Young.
- Alma—Dr. N. F. McClinton.
- Niles—B. F. Earl.
- Marquette—Daniel Vaughan.
- Mt. Pleasant—H. F. Duel.
- Iron Mountain—R. T. Miller.
- Manistique—W. L. Middlebrook.
- Crystal Falls—Arvid Bjork.
- St. Ignace—Peter J. Murray.
- Negaunee—J. H. Winter.
- Ishpeming—P. P. Keese.
- Ironwood—D. E. Sutherland.
- Bay City—Edward P. Evans.
- Au Sable—George Sutherland.
- Jackson—Daniel C. Sauer.
- Flint—Guy Selby.
- Coldwater—A. A. Sherman.
- Greenville—W. H. Bradley.
- Hillsdale—E. C. Schupp.
- Bad Axe—W. H. Linkin.
- Pontiac—A. J. Johnson.
- Cheboygan—F. F. Baskert.
- Manistee—W. J. Barnhart.
- Muskegon—Harry Rietdyke.
- Albion—A. F. Cooper.
- Clare—Dr. A. F. Mulders.
- Lapeer—Samuel G. Brown.
- Boyne City—J. H. Charters.
- Owosso—Wallace D. Burke.
- Corunna—Wilhelm A. McMullen.
- Charlotte—R. S. Spencer
- Kalamazoo—Frank H. Milham.
- Cadillac—Mayor Matheany.
- West Branch—R. C. McKay.
- Midland—Stewart B. Gordon.
- Ludington—Charles E. Cartier.
- Alma—Dr. N. F. McClinton.

Illinois—
- Springfield—John S. Schnepp.
- Clinton—George S. Edmondson.
- Leroy—J. A. Tuthill.
- Chenoa—B. F. Elfrink.

Kansas—
- Tribune—Clement L. Wilson.

South Carolina—
- Greenwood—Kenneth Baker.

Elections of City Officers.

The elections held in certain states during April resulted in the election of municipal officers as follows:

Michigan—
- Bay City—City treasurer, Edward Corliss; city recorder, Lovell U. Grant.
- Alpena—City recorder, William P. Collins; controller, James Bowden.
- Boyne City—City clerk, J. L. Ekstrom; treasurer, George E. Wolvin.

Illinois—
- Springfield—City treasurer, Harry Hofferkamp; city clerk, J. Emil Smith.
- Clinton—City clerk, Charles R. Griffith; city treasurer, O. A. Day.
- Bloomington—City clerk, Harry E. Rhoads; city engineer, Elmer Folsom; superintendent of streets, John F. Anderson; city treasurer, Frank M. Rice.
- Normal—City clerk, J. B. Miller.
- Old Town—City clerk, Henry Stauffer; highway commissioner, Clinton Miller.
- Dawson—Town clerk, Roy Bullinger; commissioner of highways, John Weidner.
- White Oak—Town clerk, J. W. Zoofi; commissioner of highways, Jacob Schad.
- Blue Mound—Town clerk, C. A. Brown; commissioner of highways, Fred Zabie.
- Yates—Town clerk, C. E. Graves; commissioner of highways, Charles H. Burns.
- Anchor—Town clerk, C. L. Gordon; commissioner of highways, M. Klintworth.
- Empire No. 1—Town clerk, John B. Chick; commissioner of highways, dist. No. 3, John Sigler.
- Empire No. 2—Town clerk, John B. Chick; commissioner of highways, dist. No. 3, John Sigler.
- Empire No. 3—Town clerk, G. Grant Smith; commissioner of highways, dist. No. 3, John Sigler.
- Towanda—Town clerk, Samuel McMullen; commissioner of highways, J. A. McAvoy.
- Cropsey—Town clerk, Ray Ward; highway commissioner, C. E. Labertew.
- Allin—Town clerk, George Smith; highway commissioner, J. M. Murphy.
- Danvers—Town clerk, John S. Popple; commissioner of highways, Joseph C. Maurer.
- Downs—Town clerk, T. S. Innis; highway commissioner, Mayo Golden.
- Mt. Hope—Town clerk, William Sage; commissioner of highways, M. L. Stubblefield.
- Hudson—Town clerk, Thomas Condon; commissioner of highways, Henry Groves.
- Gridley—Town clerk, William Niergarth.
- Dry Grove—Town clerk, Henry Schwartz; highway commissioner, E. S. Kaufman.
- Arrowsmith—Town clerk, V. E. McClure; highway commissioner, George A. Builta.

Lawndale—Town clerk, H. J. Juers; highway commissioner, Lee Vawter.
Dale—Town clerk, C. U. Bower; commissioner of highways, F. B. Johnson.

Civil Service Examinations.

The U. S. Civil Service Commission will held examinations at the usual places as follows:

May 5: Mechanical assistant in field investigations, Bureau of Plant Industry, Department of Agriculture, at $900 to $1,000 a year. A small man is required, as the work is on fruit refrigeration before and during transportation, and will often be in restricted quarters.

Personal Notes.

E. L. O'Banion has been elected mayor at Storm Lake, Iowa.

R. H. Ashworth has been re-elected city engineer at Colorado Springs, Colo.

E. W. Hess, of Clearfield, Pa., has been elected borough engineer of Curwinsville, Pa.

E. A. Kingsley has been re-elected superintendent of public works at Little Rock, Ark.

Hon. E. N. Woodruff, former mayor of Peoria, Ill., has been elected mayor of that city again to succeed Mayor Thomas O'Connor.

S. Bent Russell, M. Am. Soc. C. E., consulting engineer, has removed his office to the Security building, 408 Locust street, St. Louis, Mo.

W. D. Smith has been reappointed superintendent and J. D. Schulte appointed president of the board of water commissioners at Lestershire, N. Y.

H. H. Lotter has resigned as assistant engineer on the Yakima Project, U. S. Reclamation Service, to accept a position as city engineer at Vancouver, Wash.

F. W. Dohrmann has been appointed park commissioner by Mayor Taylor, at San Francisco, Cal., to fill the vacancy caused by the death of Reuben H. Lloyd.

J. Y. McClintock, county engineer of Monroe county, New York, has been elected president of the New York State Association of County Engineers and Superintendents of Highways.

W. C. Blanchet has been elected mayor and L. M. McArthur city engineer at Stamford, Texas. Mr. McArthur has opened up an office in connection with his office as city engineer, and will practice all kinds of general engineering.

John Finan has accepted a position with the Northwestern Construction Company, of Franklin, Pa., as engineer and superintendent of construction, and will be in charge of state highway construction this season.

John Nolan, landscape architect, Cambridge, Mass., has printed in a leaflet a paper on "City Making," which he read at the last meeting of the American Civic Association. It also has a short bibliography of books and articles on the subject.

Edward C. Sherman, Assoc. Am. Soc. C. E., division engineer Charles River Basin Commission, Boston, Mass., has been appointed designing engineer under Lieut.-Col. H. F. Hodges, assistant chief engineer of the Isthmian Canal Commission. Mr. Sherman's address will be Culebra, Canal Zone.

MACHINERY AND TRADE

Universal Brick Company.

The new plant of the Universal Brick Company at Utica, Ill., is nearing completion, and will be producing brick in about thirty days. The product will be known as Universal Granite Brick, and will be manufactured from cement and sand. The plant is modern in every way, and is equipped throughout with the latest improved machinery. The cement used is manufactured on the ground, and an apparently inexhaustible supply of very excellent sand is on the company's property. Some bricks made for experimental purposes have shown most satisfactory results in the tests for strength, absorption, etc., and the indications are very favorable for the production of a superior quality of building brick. One advantage of this product is the fact that it can be made any color desired. The large capacity of the plant, together with exceptional shipping facilities, will enable the company to guarantee prompt deliveries in large quantities.

A New Sanitary Street Washing Machine.

Street sweepers are dust producers under the ordinary conditions in which they are used. Street flushers, in which the water is used under pressure, may very easily become street destroyers, and they use large quantities of water. The street sweeping gang consists ordinarily of a sprinkling wagon, about three sweeping wagons, and a force of gutter cleaners and teams to haul away the collected dirt.

The Kindling Machinery Company are introducing a machine for street cleaning which uses far less water than the flushing process, and at the same time is quite as sanitary. It stirs up no dust, like the sweepers, and it therefore reduces the number of bacteria floating in the air,

rather than increasing them, and it includes in one machine the sprinkler and the street cleaner. The following from Foster Crowell, of the New York street cleaning commission, shows the results in these respects:

Experiments have shown that in the residential districts the squeegee uses only an average of 0.11 to 0.12 gallon of water to each square yard of street surface cleaned, while in the more congested tenement section the rate runs from 0.125 to 0.250 gallon to the yard, as a greater quantity of water must be used there to loosen the accumulated dirt.

By a recent series of interesting experiments the sanitary efficiency of the squeegee has been pretty well demonstrated, as well as its economy. Bacteria culture plates were exposed in the streets in different localities, and the number of bacteria colonies developed on them during exposures at the same localities before and after street cleansing by means of the squeegees was some measure of the sanitary effectiveness of the machines.

In Fifth avenue, for instance, between Seventh and Eighth streets, a plate exposure before the street was cleaned developed 200 colonies, but after the street had been cleansed a new exposure showed their number had been reduced to only 29.

The machine is a rubber squeegee, like those used for cleaning windows, a number of the rubber blades being arranged spirally on a revolving drum, and a water tank. The street is thoroughly sprinkled from the tank immediately in front of the revolving squeegees, which wipe the street clean and force the wet material to the gutter. Enough machines are used in a gang to clean one-half of a street to the gutter, a return trip cleaning the other half. Two machines, one following the other, are more economical than one, except on narrow alleys. One machine will clean 35,000 to 40,000 square yards a day, and two machines will more than double the amount. Mr. Crowell's report shows that the amount of water used is very small, especially when the thoroughness of the work is considered.

Causes of Corrosion of Iron.

The causes of corrosion of steel and iron products have for years been the subject of diligent research and experiments by ambitious metallurgical chemists the world over.

The most plausible explanation for corrosion is the theory of chemical electrolysis. This theory is that certain impurities or foreign substances, carbon, manganese, phosphorus, sulphur, etc., commonly found in iron and steel, tend, when segregated, to produce an electrical action which is responsible for corrosion.

It is the common conclusion that where two metals are connected together and immersed in a salt or acid solution, a battery is formed and an electric current flows through the circuit. This is due to the difference in electrical properties of the two metals, scientifically termed the difference of potential.

Similarly, if certain impurities or foreign substances are unevenly distributed or collect at various points in iron or steel, a difference of potential is produced, which, aided by moist air or water, containing oxygen, completes the battery, causing an electrical current to flow between these points. This produces the chemical action which causes corrosion.

Thus it is unanimously conceded that corrosion in iron and steel is, primarily, due to certain impurities and their uneven distribution or segregation through the metal.

It is a recognized fact that pieces of galvanized metal sheets removed by excavation after more than thirty years of embedment in the ground have been found in a perfect state of preservation. Analytical investigation has demonstrated these to be of the purest quality iron it was possible to make in former years. This, together with scientific tests, has had its weight with metallurgists in arriving at their conclusions for causes of corrosion.

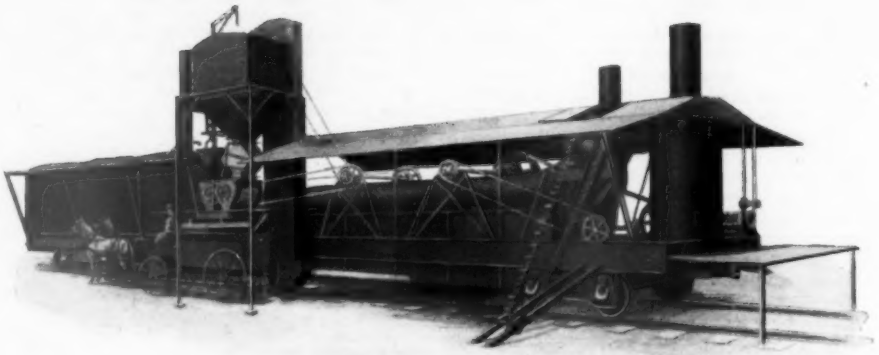
The Canton Culvert Company, of Canton, O., have acted upon the knowledge gained by these investigations, and have produced as perfectly pure iron as is commercially practicable, calling it No-Co-Ro metal. Of this iron, when galvanized, they make the well-known Acme corrugated metal culverts, whose durability they are ready to guarantee for twenty-five years, when properly installed.

Who Makes What.

The above is the title of a book of reference for buyers in the hardware field which is published by Daniel T. Mallett, 253 Broadway, New York, who is also the publisher of the *Hardware Dealers' Magazine*. The first part is a directory of the wholesale hardware houses and jobbers of the United States and Canada, with a brief history of each and statement of the extent and character of business. The second part is a geographical list of manufacturers in the hardware field, catalogs of whose products are on file with the editor. The third part is an alphabetical list of products or goods with reference to the manufacturer from which each can be obtained. The fourth part is a list of foreign merchants or importers, interested in hardware, obtained from the U. S. consuls. The fifth part is a directory of exporters, foreign buyers and commission houses handling export business, located in New York. The book is one of much interest to many in other lines of business, though it is, of course, of special value to those in the hardware and allied trades.

A Portable Railway Asphalt Paving Plant.

The accompanying photographs show two views of the one-car portable asphalt paving plant made by the F. D. Cummer & Son Co., Cleveland, O. One cut shows the plant erected ready for operation, and the



CUMMER ONE-CAR ASPHALT PLANT.
I. Ready for Operation.

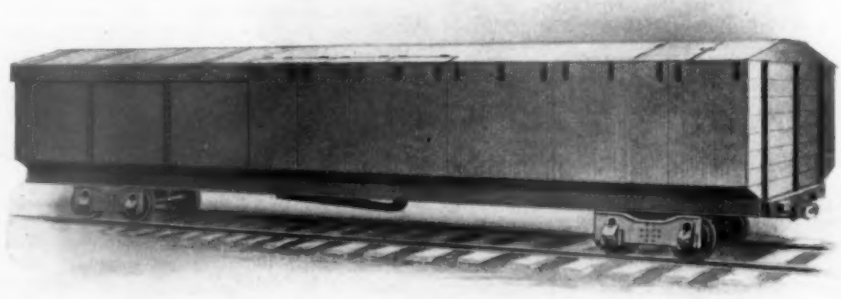
other cut shows the plant knocked down and housed ready for shipment.

This plant has an easy capacity for turning out 1,700 yards of 2-inch top per day of ten hours.

The car frame is 60 feet long, and consists of two 24-inch I beams, 100 pounds to the foot, securely fastened together by cross beams. This frame is mounted on two sets of 100,000 pounds capacity all-steel trucks.

On this car frame is mounted the complete asphalt paving plant, consisting of an automatic engine housed in a cast iron dust-proof casing, boiler, sand drum, 10-foot steam-jacketed mixer, asphalt hoist, six-ton capacity sand bin with screen, diamond sand box, asphalt bucket with double beam scale, three asphalt kettles in their housings, having a combined capacity for holding thirty-six tons of asphalt. One of these kettles is closed and mechanically agitated; the other two kettles are open, with suitable hinged covers to shed the rain. The plant has the necessary 4-inch asphalt piping, with 5-inch steam jacket, together with elevators, conveyors and power transmitting machinery. In fact, the plant is complete in every particular. The car is equipped with Westinghouse air brakes, and is within the specifications of the Master Car Builders' Association, so that it can travel over any standard gauge road in the country.

It is such plants as this which are making it possible to extend the use of asphalt, both because the cost of laying the pavement is reduced, and because the smaller cities can be reached, where the amount of work is not sufficient to warrant the erection of a permanent plant. The repair of streets is also facilitated by the ease and comparatively small expense with which the plant can be moved from place to place. Full information and prices will be given by the company on application.



CUMMER ONE-CAR ASPHALT PLANT.
II. Housed Ready for Transportation.

Wooden Block Paving Satisfies.

The following is from the report of a committee of the Market Street Merchants' Protective Association of Philadelphia, which inspected some twenty-five or thirty streets in New York laid with wooden blocks treated by the creo-resinate process. They returned and described in a report the condition of each street visited. The report then says:

After having gone over this territory, there was not the least doubt left in the minds of your committee as to why wood block paving was being used by some of the largest cities in the world, for the poorest street paved with wood block which we saw in New York city was many times better than the best street in Philadelphia paved with either asphalt or Belgian block. In fact, the difference was so apparent that your committee felt that the Philadelphians had been napping again, and were about five years behind the times.

To assure ourselves that this impression was correct, your committee called on a number of merchants whose places of business front on streets paved with wood block, and did not find one dissenting voice. On the contrary, many of these merchants grew enthusiastic on the subject, and went out of their way to tell us of the many advantages of this kind of paving.

Two points were called to our attention by almost every one we interviewed. Our attention in every case was called to the absolute noiselessness of wood block paving, and in many cases the merchants absolutely claim that they could trace a direct increase in business since their streets had been repaved, and a decided advantage in the conduct of their business, as they no longer had the least bit of trouble in using telephones, nor did they experience any inconvenience in conversing with customers, even when close to the street. In reference to this question, we further beg to state that your committee sat in an automobile right in the midst of heavy drays passing to and fro, for a period of at least fifteen minutes, and during that time did not experience the least difficulty in making themselves heard in speaking in an ordinary conversational tone. Another point called to our attention was the almost absolute lack of dust and dirt, and without hesitation your committee can safely say that the wood block paved streets we went over in New York were beyond doubt the cleanest streets we had ever seen anywhere. This condition is largely due to the ease with which this paving is cleaned, either by flushing or a heavy rainfall.

Together with a number of other questions, we made it a point to ask every merchant: "If your street were to be repaved, would you favor wood paving?" In every instance the answer was a decided yes.

Trade Publications.

The shipping of empty sacks is discussed in Monthly Bulletin No. 59 of the Universal Portland Cement Co., Chicago and Pittsburg. There is the usual large number of illustrations of structures in which Universal Portland cement has been used.

James W. Howard, 1 Broadway, New York, announces his special chemical and physical testing laboratory for testing paving materials of all kinds before, during or after use, including the newer road cements and binders and road oils, as well as all the standard materials in use for years.

Steam shovels, automatic buckets and locomotive cranes are the subjects of three bulletins of the Browning Manufacturing Co. and the Browning Engineering Co., of Mansfield and Cleveland, O.

The March bulletin of the Corrugated Bar Co. treats of conduits and sewers.

The Bausch & Lomb new builders' combination transit and level, a very low-priced instrument, is described in a circular of the Bausch & Lomb Optical Co., Rochester, N. Y.

The Austin Manufacturing Co., Chicago, Ill., issue a bulletin of some interesting events in the remarkable progress of the American motor road roller during the past season.

The Wyckoff Pipe and Creosoting Co. distributes specifications for creosoted wood block pavement.

The latest issues of Lehigh Portland cement bulletins describe a reinforced concrete elevator of 140,000 bushels capacity, the Fisher automobile garage, and a concrete school building in Indianapolis, the latter the first in the city. They are issued from the Indianapolis office of the company, F. E. Paulson, traffic manager.

The Rudolph S. Blome Company, Unity Bldg., Chicago, Ill., issue a booklet, "The Truth About the Paving Problem," which answers fully the arguments in the anonymous and other attacks which have recently been made on their granitoid concrete street pavement, and which lost much of their force because of the unwillingness of any one to give them a local habitation.

A new circular of the Barrett Manufacturing Company shows some great roof areas covered with pitch laid according to the Barrett specifications, which have been in successful service for twenty to thirty-five years. It also gives the specifications for standard gravel or slag roofing over boards and over concrete.

The Republic Creosoting Company, Indianapolis, Ind., sends a fully illustrated booklet on Kreodone wood block pavements, with photographs showing pavements under many conditions and views of the company's creosoting plants at Indianapolis, Mobile and Minneapolis.

Theo. Alteneder & Sons issue a circular concerning their opaque-edge transparent

triangles, which are very convenient and an aid to accuracy in placing.

The Superior Portland Cement Company, Cincinnati, O., sends a handsomely illustrated leaflet showing views of the manufacturing plant at Superior, near Ironton, O., and of many buildings, dams, locks, etc., in which the Superior cement has been successfully used.

Trade Notes.

CEMENT.

Hudson, N. Y.—The New York and New England Cement and Lime Co. has been incorporated under the laws of the state of New York, and will take over the plant of the former Hudson Portland Cement Co. of this city. The directors of the company are Alfonso de Navarro, John R. Maxwell, Jr., of New York City; Howard W. Maxwell, Brooklyn; Henry Graves, Jr., Irvington, N. Y.; Willis E. Miner, Roselle, N. J.; Harry J. Seaman, Catasauqua, Pa.; James N. Catlow, West Orange, N. J.; A. C. Orell, Allentown, Pa.

Sandusky, O.—The Lake Shore Portland Cement Co. has been organized, and has erected a plant here for the manufacture of Portland cement. The incorporators are G. G. Bennett, C. L. Engels, G. A. Hogue, J. E. Harmen, T. L. Paulson, George A. Philbrick and Claude B. De Witt.

Los Angeles, Cal.—The Victor Portland Cement Co. has reorganized by electing new officers and directors, as follows: President, D. A. Mulvane; first vice-president, Lycurgus Lindsay; second vice-president, F. E. Engstrum; third vice-president, Richard Lacey; secretary, J. G. Meacham, treasurer, Orra Monnette. The company will erect a modern cement plant at Victorville.

Sandusky, O.—Special.—The Sandusky Portland Cement Co. advises us that it is furnishing White Portland cement for use on the following contracts: Point Building, Cleveland, O.; Western Newspaper Union Building, Chicago; Clean Dairy Co. Building, St. Louis, Mo., for cement floor work; Campbell Building, Oklahoma City, for facing the entire front; Battle Creek Sanitarium, for finishing bath rooms; dormitory, Pomona College, Claremont, Cal., entire exterior finish; Northwestern University Building, Evanston, interior stairs and baluster work. The company is also furnishing its Medusa waterpoorf compound for the following contracts: Swimming pool at Wilmerding, Pa.; Blackstone Hotel, Chicago; City Hospital, St. Louis, in plaster and wainscoting; U. S. government work, Portland, Me.; St. Anthony Hotel, San Antonio, Tex.; D., L. & W. collieries, concrete dam, Scranton, Pa.; East Jersey Water Co., concrete sewage tank, Summit, N. Y.

Gloucester, Mass.—The Russia Cement Co. has established its plant at Anacortes, Wash.

Asotin, Wash.—The West Coast Portland Cement Co. will erect a plant this summer on the Snake river.

The Kosmos Portland Cement Company, Kosmosdale, Ky., whose plant was burned last fall, commenced rebuilding October 20, and now has all new buildings of steel and concrete, which are fireproof. The machinery was all overhauled and replaced with new where found to be even slightly damaged, increasing the capacity slightly and providing for doubling in the near future. The first shipment of cement from the new plant was made on March 30.

CONCRETE BLOCKS.

Cincinnati, O.—The Egyptian Cement Products Co. has been organized here by A. Golder, C. F. Windeln, H. Reichman, M. Alpert and L. Reichman.

Sharpsville, O.—A cement block plant will be erected here by E. L. Gaines and William Reichard.

Harriman, Tenn.—The Southern Construction Co. has been incorporated by W. H. Grannis, T. A. Christmas, W. H. Spencer and others, and will quarry and crush stone, construct cement buildings and manufacture cement blocks.

Janesville, Wis.—The Eureka Cement Block and Tile Co. has been incorporated, with officers as follows: President, G. L. Davis; vice-president, C. W. Taylor; secretary and treasurer, F. H. Schlutsmeyer.

Bowman, N. D.—The establishment of a plant for the manufacture of concrete blocks and floor and roofing tile is contemplated by M. W. Campbell and George L. Winters.

Crandall, S. D.—J. D. Hutchinson will continue the manufacture of cement blocks this spring, and will extend his business.

Algona, Iowa—Albert Butterfield, of Irvington, Iowa, has under consideration the establishment of a cement tile plant here.

Cullom, Ill.—The concrete plant of Walter Farmer is proving very successful. He manufactures building blocks, burial vaults, lawn vases, porch posts, fence posts, etc.

Enid, Okla.—The Egyptian Vault Co., recently incorporated for the purpose of manufacturing and selling a concrete burial vault, is running under the management of A. E. Larson.

Greenville, Miss.—The Greenville Cement Tile Co. has been organized by J. H. Crouch, Natah Goldstein and others.

Fostoria, O.—The Fostoria Concrete Products Co. has been incorporated by John S., Amy N., S. A. and Oscar V. Maurer and Josiah Noble.

New York City—The Concrete Products Co. has been incorporated for concrete construction work by R. F. Tucker, G. H. Guy, of New York City; K. L. Martin, Brooklyn; P. A. Tomes, Woodmere, L. I., and M. Watson, East Orange.

Huntsville, Ala.—The Huntsville Concrete Co. has been incorporated by John M. Hampton, as president; E. H. Trebes, general manager; Robert B. Wade, secretary and treasurer.

PURCHASE OF MACHINERY.

Lebanon, Ky.—Special.—A. J. Stormes advises us that he is in the market for trowels, groovers, wheelbarrows, buckets, an edger, etc.

Enterprise, Ore.—Special.—P. R. Ferguson desires to purchase a cement block machine and mixer.

Middletown, Pa.—Special.—J. B. Brubaker, R. D. No. 2, is in the market for an edger for working around a short bend. He desires prices.

Oelwein, Iowa—Special.—D. S. Hillman, 14 Seventh avenue South, advises us that he wants to purchase a road plow, not too heavy, and desires catalogues.

Trenton, Mo.—Special.—V. O. Hobbs is in the market for a steam roller and a street sweeper.

Waterloo, Iowa—Special.—The Waterloo Cement Machinery Corporation desires to communicate with parties manufacturing pressed steel molds to be used in monolithic construction.

Memphis, Mo. — (Special.) H. H. Schenck advises us that he is starting a plant to make concrete products, concrete drain tile in particular, and needs a sand

washer and screens, a tile machine and tile molds, a block machine, a post machine, a small mixer, and numerous other things.

New Bedford, Mass.—(Special.) L. E. Bertram, 59 Borden st., is in the market for concrete block forms.

Marion, Kas.—(Special.) Fred Lewis has a good Normandin block machine and a 6-in. window and door cap mold for sale.

PURCHASE OF MATERIALS.

Lebanon, Ky.—Special.—A. J. Stormes advises us that he is in the market for Portland cement, granite dust and colors.

Chicago, Ill.—(Special.) C. D. Bassett, M. E., 7624 Jackson ave., advises us that he is in the market for white cement, white sand or Silica sand.

MISCELLANEOUS.

Summit, N. J.—The Commonwealth Construction Co. has been incorporated, and will engage in the construction of bridges, viaducts and sewers. The incorporators are Edmund C. Walsh, William P. Fleming and James J. Walsh.

Chicago, Ill.—The Chicago Concrete Tool and Specialty Co. has been incorporated to manufacture and deal in contractors' supplies, by Dwight Mackay, Daniel L. Madden and Ada S. Mitchell.

Gary, Ind.—The Gary Concrete Construction Co. has been formed to manufacture concrete blocks for all purposes, the construction of concrete houses and cement sidewalks. The officers are: President, J. E. Grimes; vice-president and general manager, C. Denbo; secretary-treasurer, Frank W. Hartzer.

Johnstown, Pa.—A company is being organized for the erection of a terra cotta sewer pipe plant at South Fork, near here. W. H. Haws, of this city, is interested.

Chicago, Ill.—The Barrett Manufacturing Co. is planning to erect a plant at Sacramento avenue and the south branch of the Chicago river. The company manufactures roofing and paving materials.

Salt Lake City, Utah—(Special.) The contract for furnishing street signs was awarded to the American Sign Co., of Clyde, O., for $3,350.90.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Charleston, W. Va.—The Atlantic Bitulithic Co. has commenced the work of constructing bitulithic paving in Kanawha st.

Columbia, S. C.—Under the Civic League the streets of this city are being improved under a new plan. The macadam recently removed from Main st. is being used in resurfacing the residence streets, and various other improvements are being made or are contemplated.

CONTEMPLATED WORK.

Buffalo, N. Y.—William st. will be paved at once with stone.

Dayton, O.—City council has decided to pave Hickory st.

Geneva, N. Y.—Paving is contemplated for Lockland road.

Duluth, Minn.—Macadam paving is proposed for 4th st.

Harlan, Ia.—About 3 blocks of paving is contemplated.

Mt. Carmel, Pa.—A resolution has been passed for paving Oak st.

Payallup, Ia.—Paving is contemplated for the business section of this city.

Anamosa, Ia.—City council voted to pave Huber st. with vitrified brick.

Rochester, N. Y.—An ordinance has been passed for paving Plymouth ave.

North Tonawanda, N. Y.—The paving of Vandervoort st. is contemplated.

Meridian, Miss.—The question of street paving is still under consideration.

Cisco, Tex.—The construction of concrete sidewalks is contemplated.

Marquette, Mich.—About 11 mis. of concrete walks is contemplated this summer.

Mt. Pleasant, Ia.—Council is considering the question of street paving.

Council Bluffs, Ia.—Brick paving is contemplated for Broadway, from 1st to 12th.

Marshalltown, Ia.—Petitions have been circulated asking for the paving of streets.

Indianapolis, Ind.—An ordinance has been adopted for opening and widening Traub ave. and for constructing cement sidewalks in a number of streets. Jos. T. Elliott, prest. B. P. W.

Albany, N. Y.—Ordinances have been passed for paving Slingerland ave. and Marshall st.

Philadelphia, Pa.—Ordinances are pending for the paving of Market st. Mayor Reyburn.

Oconomowoc, Wis.—Vitrified brick or creosoted wood block paving is proposed for Main st.

Plymouth, Ind.—Bids will be received soon for paving 2 streets with Poston blocks.

Oelwein, Ia.—Paving is proposed for N. Frederick and E. Charles sts. and 1st ave. East.

Bucyrus, O.—A resolution has been passed for paving Mansfield st. including the public square, with brick, asphalt, bitulithic or bituminous macadam or asphalt block. E. J. Songer, mayor.

Milwaukee, Wis.—The bd. of pub. wks. has recommended a large amount of macadam and asphalt paving.

Memphis, Tenn.—The park commission contemplates paving about 30 mis. of streets during this summer.

Montesano, Wash.—Grading and gravelling is contemplated for a number of streets. Mayor Ninemire.

Grinnell, Ia.—Bitulithic paving has been recommended for the business and residence streets.

Utica, N. Y.—Ordinances have been passed for paving Kernan and Fulton aves. and Jay, Liberty and other streets.

Tabor, Ia.—An ordinance has been passed providing for the construction of a cement sidewalk in Main st. Town coun.

Des Moines, Ia.—The property owners in Grand Ave. are circulating a petition for paving that thoroughfare with sandstone.

Bloomington, Ill.—The city engineer has been directed to prepare estimates for paving Evans st. with brick and asphalt.

Port Huron, Mich.—Voted to issue $25,000 bonds for the construction of 10 mis. of macadam roads in Kimball tp.

Edmonton, Alta.—City council has authorized the expenditure of $116,000 for paving the streets with bitulithic.

Stamford, Tex.—(Special). L. M. McArthur, cy. engr., says this city has voted $20,000 4 per cent. 20-yr. bonds for street improvements.

Winnipeg, Man.—City council has decided to pave certain streets with asphalt this year, at a cost of $510,000. H. N. Ruttan, cy. engr.

Riverside, Cal.—A resolution has been passed providing for the construction of a cement sidewalk in Magnolia ave. G. T. McIntyre, supt. of sts.

Tiffin, O.—Ordinances have been approved for paving Miami st. with brick or block or asphalt block, and Clay st. with brick or block. Jos. C. Arnold, mayor.

Woodbury, Tenn.—The legislature has under consideration a bill giving this county the right to vote on the issue of $75,000 bonds for constructing roads.

Robinson, Ill.—(Special). Stoy J. Maxwell, cy. atty., advises us that this city contemplates the construction of about 3 mis. of street paving this spring and summer.

Grand Island, Neb.—A petition will be circulated to ascertain the kind of paving desired for street improvement for 34 blocks. Brick, wooden block and cement paving are advocated.

South Orange, N. J.—Ordinances have been passed providing for the construction of cement and flag sidewalks in a number of streets. Edward R. Arcularius, clk. So. Orange twp.

Chicago, Ill.—The property owners in S. State st. have organized to secure the paving of that street between 39th and 63rd sts. The repaving of LaSalle st. with creosoted wood blocks is contemplated.

Cincinnati, O.—Estimates have been prepared for paving Clifton ave. with bitulithic or wooden blocks. Resolutions have been passed for paving Clinton Springs, Hermosa, Craig aves., 6th, North, Barr, Smith and Elmore sts.

CONTRACTS TO BE LET.

Fond du Lac, Wis.—Bids are asked until May 8 for cement paving work. B. P. W.

Oakley, O.—Bids are asked until May 4 for macadamizing Webster ave. Oscar Kosche, vil. clk.

Vincennes, Ind.—Bids are asked until May 4 for constructing gravel roads. Co. audt. Scott.

Bluffton, Ind.—Bids are asked until May 5 for constructing gravel roads. O. D. Garrett, co. audt.

Decatur, Ind.—Bids are asked until May 3 for constructing macadam roads. H. S. Michaud, co. audt.

Spencer, Ind.—Bids are asked until May 8 for macadamizing roads. Geo. W. Edwards, co. audt.

Marion, Ind.—Bids are asked until May 15 for constructing a gravel road. A. Y. Stout, Co. audt.

Milnor, N. D.—Bids are asked until May 5 for grading roads. O. B. Hellen, Clk. Shuman twp.

Covington, Ind.—Bids are asked until May 4 for constructing a highway. Wm. B. Gray, co. audt.

Two Harbors, Minn.—Bids are asked until May 17 for macadamizing 4th and 2nd aves. Cy. clk.

Brazil, Ind.—Bids are asked until May 6 for constructing gravel roads. J. L. Burns, co. audt.

Brownstown, Ind.—Bids are asked until May 4 for constructing 3 gravel roads. H. W. Wacher, co. audt.

Monticello, Ind.—Bids are asked until May 4 for constructing a gravel road. J. L. Ackerman, co. audt.

Greensburg, Ind.—Bids are asked until May 3 for constructing a macadam road. Frank E. Ryan, co. audt.

Bloomington, Ind.—Bids are asked until May 5 for constructing gravel roads. Horace Blakeley, co. audt.

Bloomfield, Ind.—Bids are asked until May 4 for constructing gravel roads. Peter M. Cook, co. audt.

Columbus, O.—Bids are asked until May 12 for macadamizing the National road. John Scott, co. audt.

Valparaiso, Ind.—Bids are asked until May 3 for constructing a gravel road. Stephen P. Corboy, co. audt.

Franklin, Ind.—Bids are asked until May 3 for constructing 2 gravel roads. W. B. Jennings, co. audt.

Greencastle, Ind.—Bids are asked until May 17 for macadamizing a road in Greene twp. D. V. Moffett, co. audt.

New Ulm, Minn.—Bids are asked until May 4 for constructing cement crosswalks. Ernest Wicherski, cy. clk.

Toledo, O.—Bids are asked until May 12 for repairing a number of roads. D. T. Daviess, Jr., co. audt.

Janesville, Wis.—Bids are asked until May 4 for improving various streets. St. assessments com.

Fowler, Ind.—Bids are asked until May 4 for constructing gravel roads. Lemuel Shipman, co. audt.

Huntington, Ind.—Bids are asked until May 10 for constructing a highway. John W. Weaver, co. audt.

Centralia, Wash.—Bids are asked until May 4 for grading a number of streets. W. H. Hodge, cy. clk.

Crown Point, Ind.—Bids are asked until May 3 for constructing gravel road. Chas. A. Johnson, co. audt.

Terre Haute, Ind.—Bids are asked until May 3 for improving a road in Honey Creek twp. Nathan G. Wallace, co. audt.

Winston-Salem, N. C.—Bids are asked until May 5 for constructing 5 mis. of macadam road. Bd. co. coms.

Cadiz, O.—Bids are asked until May 5 for constructing 8,048 sq. yds. of brick paving. W. H. Lucas, vil. clk.

Jasper, Ind.—Bids are asked until May 3 for constructing a gravel road. M. A. Sweeney, co. audt.

Paoli, Ind.—Bids are asked until May 4 for constructing a road in Orleans twp. Alvin B. Ham, co. audt.

Hartford City, Ind.—Bids are asked until May 3 for construction of a macadam road. L. W. Daugherty, co. audt.

Grand Forks, N. D.—Bids are asked until May 3 for constructing cement sidewalks. W. H. Alexander, cy. audt.

Petersburg, Ind.—Bids are asked until May 5 for constructing 7 gravel roads. Frank R. Bilderback, co. audt.

Delphi, Ind.—Bids are asked until May 3 for constructing gravel or macadam roads. M. G. Haun, co. audt.

Noblesville, Ind.—Bids are asked until May 11 for constructing gravel or stone roads. N. W. Cowgill, co. audt.

Chardon, O.—Bids are asked until May

3 for grading, draining, etc. Big Hill on Claridon st. W. W. Hollis, co. audt.

Philadelphia, Pa.—Bids are asked until May 11 for abolishing grade crossings. W. Hunter, ch. engr. P. & R. Ry. Co.

Springfield, Mo.—Bids are asked until May 6 for paving Market, College and Center sts. with brick. H. C. Horton, engr.

Winamac, Ind.—Bids are asked until May 7 for constructing a system of gravel roads. Ellis S. Rees, co. audt.

Williamsport, Ind.—Bids are asked until May 3 for constructing a gravel road. Robt. L. Winks, co. audt.

Sidney, O.—Bids are asked until May 3 for paving a number of streets with brick. W. L. Heiser, clk. B. P. S.

St. Paul, Minn.—Bids are asked until May 3 for improving Rice st., Centerville, and Manomin roads. Edward G. Krahmer, co. audt.

Mt. Gilead, O.—Bids are asked until May 7 for constructing North Bloomfield stone road No. 1. W. C. McFarland, co. audt.

Wahpeton, N. D.—Bids are asked until May 3 for constructing cement sidewalks, curbs and gutters. W. R. Purdon, cy audt.

Bowling Green, O.—Bids are asked until May 17 for macadamizing the Fred Painert and Thos. Shanks roads. F. W. Toan, co. audt.

Portsmouth, Va.—Bids are asked until May 6 for furnishing in cartons on wharf 140,000 sidewalk paving brick. Bascom Sykes, cy. engr.

Peoria, Ill.—Bids are asked until May 3 for constructing cement sidewalks in a large number of streets. E. A. Furry, prest. bd. local impvts.

New Brighton, Pa.—Bids are asked until May 6 for paving 12th st. with vitrified brick and hill blocks, concrete curb and gutter, etc. Town coun.

Afton, S. D.—Bids are asked until May 15 for regrading 5 mis. of road and graveling 10 mis. O. B. Olson, clk. bd. supvrs.

Minneapolis, Minn.—Bids are asked until May 3 for furnishing road work for contracts Nos. 2, 3 and 4. Hugh R. Scott, co. audt.

Palmyra, Wis.—Bids are asked until May 4 for constructing 7,000 to 10,000 ft. of standard cement sidewalks. Chas. E. Williams, vil. clk.

Paulding, O.—Bids are asked until May 14 for grading, draining and macadamizing Bowyer, Gordon and other pikes. Floyd Atwill, co. audt.

Cleveland, O.—Bids are asked until May 8 for grading and draining Cannon road, and until May 15 for improving Mayfield road. Wm. F. Black, co. clk.

Concord, N. H.—Bids are asked until May 10 for constructing a trap rock road in East Kingston, and a macadam road in Salem. A. W. Dean, state engr.

Lawrence, Kans.—Bids are asked until May 3 for constructing 25,726 sq. yds. of brick paving and 5,500 ft. of limestone curb. F. D. Brooks, cy. clk.

Atchison, Kan.—Bids are asked until May 3 for constructing 1,840 sq. yds. of brick paving and 1,100-lin. ft. of cement curbing. Fred Giddings, cy. engr

Rushville, Ind.—Bids are asked until May 6 for constructing a macadam road on the line between Rush and Fayette counties. Jesse M. Stone, audt. Rush. co.

Cresco, Ia.—Bids are asked until May 10 for constructing about 9,000 sq. yds. of brick paving on concrete base and 3,000 sq. ft. of concrete curb. Cy. clk.

Indianapolis, Ind.—Bids are asked until May 3 for curbing outer edges of certain roads, constructing catch basins, providing new inlets, etc. Jos. T. Elliott, prest. B. P. W.

Mobile, Ala.—Bids are asked until May 12 for constructing 90,000 sq. yds. of creosoted wood block paving and 60,000-lin. ft. of cement curb. Wright Smith, cy. engr.

Richmond, Va.—Bids are asked until May 4 for constructing 3 mis. of macadam road in Botetourt co. and 5 mis. of macadam road in Rockbridge co. State highway comn.

Arlington, Va.—Bids are asked until May 5 for constructing a macadam road in Arlington National Cemetery. Major M. Gray Zalinski, Depot Q. M., Washington, D. C.

Augusta, Ga.—Bids are asked until May 11 for constructing vitrified brick, Belgium block or granitoid paving and granite curbing, in certain streets. Nisbet Wingfield, cy. engr.

Gainesville, Ga.—Bids are asked until May 4 for constructing 17,000 sq. yds. of vitrified brick, wood block, bitulithic or granitoid block paving with granite curb. John B. Rudolph, mayor.

Brooklyn, N. Y.—Bids are asked until May 5 for asphalt repaving in a number of streets, 48,450 sq. ft. of cement sidewalks and 30,024 lin. ft. of new curb. Bird S. Coler, prest. boro.

Tipton, Ind.—Bids are asked until May 12 for constructing a gravel road on the line between Tipton and Clinton counties. J. F. Barlow, co. audt. Tipton co.; Chas. F. Cromwell, audt. Clinton co.

Rockville, Ind.—Bids are asked until May 17 for constructing a macadam road on the line between Parke and Putnam counties. H. A. Henderson, audt. Parke co.; D. V. Moffett, audt. Putnam co.

St. Louis, Mo.—Bids are asked until May 4 for paving several streets with asphalt, bitulithic, vitrified brick and granite block, Rosalie, Bower and other streets. A. J. O'Reilley, prest. B. P. I.

Fort Monroe, Va.—Bids are asked until May 17 for grading, surfacing, constructing concrete walks, brick gutters and macadam roads around Artillery School buildings. Capt. Ernest R. Tilton, contr. Q. M.

Chippewa Falls, Wis.—Bids are asked until May 18 for constructing 3 blocks of brick paving on concrete base and stone curb, and 5 blocks of macadam paving with stone curb. David Kirk, cy. engr.

New York City.—Bids are asked until May 3 for repaving with wood block, asphalt block, sheet asphalt and granite block on concrete base the roadways of various streets. John F. Ahern, prest. Manhattan boro.

Accomac, Va.—Bids are asked until May 3 for widening and raising 2½ ft. above its present level 1,000 yds. of road leading from Saxis Island to the Mainland. Wm. L. Nock, chm. bd. co. supvrs., Temperanceville.

Kingston, Pa.—Bids are asked until May 3 for constructing 15,000 sq. yds. of Warren Bros. bitulithic, creosoted wood blocks and brick paving on concrete base, and 10,000 lin. ft. of Wainwright concrete curb. W. J. Williams, boro scey.

Aberdeen, S. D.—Bids are asked until May 10 for paving a number of streets and avenues with macadam, creosote wood blocks, brick and asphalt. Bids are also asked until May 3 for constructing cement sidewalks in a number of streets. F. W. Raymond, cy. audt.

CONTRACTS AWARDED.

Kansas City, Mo.—The contract for grading Swope Parkway was awarded to M. G. Ela for $21,925.

La Crosse, Wis.—The contract for pav-

ing the Morman Coulee road was awarded to T. E. Wooley, for $16,129.

Grand Rapids, Mich.—The contract for paving Wealthy ave. and Commerce st. was awarded to Charles J. Carpenter.

Jacksonville, Ill.—The contract for paving Whittier ave. with brick has been awarded to the Ross & Curtis Stone Co.

Bloomington, Ill.—The contract for paving Clay st. with brick was awarded to I. D. Lain, of this city, for about $30,000.

Knoxville, Tenn.—The contract for concrete paving at the National Cemetery was awarded to Peters & Dykes, of this city.

Seattle, Wash.—The contract for paving Jackson and other streets was awarded April 2 to F. McLellan & Co., for $153,-009.

Aurora, Ill.—The contract for 25,000-sq. yds. of brick paving was awarded to the McCarthy Improvement Co., of Davenport, Ia.

Birmingham, Ala.—The contract for constructing 5.3-mis. of macadam road was awarded to the Barcliff Construction Co., for $6,054.

Peoria, Ill.—The contract for paving 5th ave. from Spencer to Saratoga, with brick, was awarded to A. D. Thompson & Co., for $6,130.

Upland, Ind.—The contract for paving Washington and Half st. with Athens block was awarded to G. A. Mason, of Monticello, for $14,844.

Edmonton, Alta.—The contract for bitulithic paving was awarded to the Bitulithic & Contracting Co., of Winnipeg, Man., for $115,000.

Syracuse, N. Y.—The contract for constructing 27,100-sq. ft. of concrete sidewalks was awarded, April 19, to John Barr, for $2,439.

Des Moines, Ia.—The contract for paving E. Walnut st. with brick was awarded to the George M. King Construction Co., at $1.81 a sq. yd.

Calgary, Alta.—The contract for 4,500-sq. yds. of bitulithic paving was awarded to the Bitulithic & Contracting Co., of Winnipeg, Man.

Webster, City, Ia.—Paving contracts have been awarded as follows: Zitterell & Sullivan, $45,000; M. Tschirgi & Son, of Dubuque, $11,000.

Albert Lea, Minn.—The contract for paving Broadway with creosoted wood blocks was awarded to Fielding & Shepley, of St. Paul, for $22,075.

Marengo, Ia.—The contract for constructing 12 blocks of brick paving has been awarded to James Horrabin, of Des Moines, at $1.64 a sq. yd.

Washington, D. C.—The contract for grading 16th st., between Webster and Kennedy sts. N. W., was awarded to G. S. Mullin at 27½ cts. a cu. yd.

Hartford, Conn.—The contract for paving Capitol with asphalt was awarded to the Southern New England Paving Co., for $5,783.

Decatur, Ala.—The contract for constructing 27½-mis. of macadam roads was awarded to Goodrich & Crinkley, of Harriman, Tenn., for $93,000.

Hailey, Idaho—The contract for constructing cement sidewalks was awarded to the Bannock Engineering Co., Ltd., April 5, at 71¾ cts. a lin. ft.

Little Rock, Ark.—The contract for constructing 40,000-sq. yds. of sidewalks in Stifft addition was awarded to Huber & Murphy, at 9¾ cts. a sq. ft.

Stockton, Cal.—The contract for paving Center st. with asphaltic concrete was awarded April 12 to the Clark & Henery Constr. Co. at 18½ cts. a sq. ft.

Sacramento, Cal.—The contract for constructing 6 mis. of Placerville road and 7 mis. of Jackson road was awarded to the McGillivray Constr. Co. for $29,503 and $47,386.

New Orleans, La.—The Barber Asphalt Paving Co. was the lowest bidder, April 19, for paving one section of Carrollton ave., and Bancroft & Ross for paving the remaining section.

Buffalo, N. Y.—The contract for repaving Richmond ave. was awarded to the German Rock Asphalt & Cement Co. for $78,290. Asphalt paving on concrete base will be the material.

Sioux City, Ia.—The contract for constructing 3 mis. of curbing and guttering was awarded to L. Christenson & Co., Lewis & Leader, P. P. Comoli and the Iowa Cement Brick Co.

Galveston, Tex.—The contract for filling streets between 43d and 46th sts. and Avenues J and L, inclusively, was awarded to the North American Dredging Co., of San Francisco, for $5,772.

Utica, N. Y.—The contract for repairing and patching with asphalt such streets as the bd. of pub. wks. may designate during 1909 was awarded to the Barber Asphalt Paving Co., April 20, at $1.25 a sq. yd.

Contracts have been awarded as follows: Kimball Place, J. C. Beasley, $10,-322; Waldeck ave., W. H. Luchtenberg & Co., $2,087; Central ave. and Stanley st., $25,878 and $3,756, respectively, W. H. Luchtenberg & Co.

Salt Lake City, Utah—The contract for constructing sidewalk extension No. 98, sec. 2, was awarded to S. Birch & Sons Co., of this city, for $750.19. P. J. Moran was awarded the contract for repairing the paved streets for $22,565.

Topeka, Kan.—The contract for constructing 30 blocks of brick paving was awarded to John Ritchie. The Kaw Paving Co. was awarded the contract for paving Mulvane st. and College ave. This latter contract calls for 15,000 sq. ft. of cement sidewalks.

Buffalo, N. Y.—Special.—Contracts have been awarded as follows: Repaving with asphalt on concrete base, Richmond ave., German Rock Asphalt & Cement Co., $83,-000; repaving Broadway with asphalt on concrete, German Rock Asphalt & Cement Paving Co., $104,510.

Kansas City, Mo.—The contract for macadamizing 1 mi. of the Parallel road west of Piper was awarded to Lightfoot Bros. at 52 cts. a sq. yd. The contract for constructing a 6-ft. sidewalk on Washington boulevard was awarded to J. S. McLaughlin & Sons, of Topeka.

Fall River, Mass.—The contract for furnishing granite curbing was awarded as follows: 4,000 ft., Ovide Ouellette, 68 cts. a ft.; 4,000 ft., Stinziano & Colucci, 69 cts.; 8,000 ft., Henry Savoie, 72 cts. O'Connor & Angell secured the contract for constructing granolithic walks at $1.29¾ a sq. yd.

Menominee, Mich.—The contract for paving Broadway and Marinette ave. was awarded to Christ. Johnson, of Oshkosh, Wis., for $19,270 and $4,165, respectively. John Striffler, of Marinette, Wis., was awarded contracts as follows: Grand boulevard, $7,240; Dunlap ave., $1,143; Ludington ave., $5,566; Weis st., $998.

Youngstown, O.—The lowest bids submitted April 13 for brick paving were as follows: Bissell ave. with cement filler, Martin Fleming, at $6,709, and with asphalt filler, Kennedy Bros., $7,373; Fruit st. with cement filler, Martin Connelly, at $6,689, and with asphalt filler, Anthony O'Harra, $7,064.

Little Rock, Ark.—The Memphis Asphalt & Paving Co., of Memphis, Tenn., was awarded the contract for asphalt paving,

April 1, as follows: 16,200 sq. yds. asphalt, including 5-in. concrete base, $2.20; 10,000 ft. stone curb, 45 cts; 10,000 cu. yds. grading, 45 cts; concrete masonry, per cu. yd., $7.50; 2,800 sq. yds. brick gutters, $2.24.

Olympia, Wash.—Bids were submitted April 5 for paving Washington, Franklin, 5th and 6th sts. with brick, except when otherwise stated: A. C. Hall & Co., Seattle, $80,000; creosote block, $74,900. B. W. Kibler, Tacoma, $95,000. B. S. Davis, Seattle, $81,296. Mills Bros., Olympia, $77,000. Lister Constr. Co., Tacoma, $77,400; creosote blocks, $75,800. R. S. Blome, Chicago, Ill., granitoid blocks, $77,319.

Indianapolis, Ind.—April 21 contracts were awarded as follows: Cement walks and curbing in Dye st., Geo. W. Shelby & Co., $1.21; Chestnut st., Marion Caldwell, $1.14 for cement walks and curbing and 35 cts. for approach walks; 24th st., John Jenkins, 59 cts. for cement walks; Bolton ave., F. W. Abel, 65 cts.; Barnes ave., M. Sapirie & Co., $1.21.

Seattle, Wash.—Paving contracts have been awarded as follows: Summit ave., P. J. McHugh—brick gutters and granite curbs, $71,139; maintenance of asphalt, $2,860.80; Jackson st., F. McLellan & Co., $152,009.35, and $11,574.25 for maintenance of asphalt; alley paving in block 15, Boren, Denny and Yesler's addn., C. W. Colt, $2,922.50.

Knoxville, Tenn.—Contracts for hauling, spreading and rolling between 30,000 and 40,000 cu. yds. of macadam in Park City was awarded to J. B. McTye at $1.35 and Peters & Gibson at $1.40 a cu. yd. The contracts for repairing the pikes in this county were divided between J. W. Gillespie, McCammon & Johnson, A. E. Karnes, H. A. Mann, F. E. Brady, Concrete Block Paving Co., J. U. Burkhart, Peters & Co., E. Franklin and A. H. Luttrell.

Ashtabula, O.—Special.—Bids were submitted Mar. 22 for constructing a tar macadam road in New Lyme and Rome twps. as follows: Jenkins & Hines, Frankfort, Ind., $27,752.40; Nimms-Clements & Co., East Orwell, O., $28,216.42; Buckeye Engineering Co., Norwalk, O., $29,592.10; Wilson & Wiswell, Windsor, O., $29,734.53; R. P. Burnett, Cleveland, O., $29,833.66; Batchelor & Wingate, Conneaut, O., $31,010.61; Waldec-Ready & Young, Warren, O., $32,263.13; Northwestern Construction Co., Franklin, Pa., $32,994.77; Uber & Breckenridge, Grove City, Pa., $40,661.27.

Rushville, Ind.—Contracts for constructing roads have been awarded as follows: Reed & Thompson, of Greensburg, for the construction of a macadam pike in Anderson twp., at $47,400; to R. W. Gauff, for the construction of a gravel road in Washington twp., at $10,600; to Holloran & Haverstick, of Noblesville, for a road in Ripley twp., at $7,376; and for the construction of the Bunt bridge to the Pan-American Bridge Co., of New Castle.

SEWERS.

Rochester, N. Y.—City Engineer Fisher and Assistant City Engineer Skinner made a recent tour of inspection of sewage plants to Cleveland and Columbus, O., and Reading, Pa.

CONTEMPLATED WORK.

Waukon, Ia.—A sewerage system is contemplated.

Mt. Vernon, Ia.—A sewerage system is proposed.

Belton, Tex.—The construction of a sewerage system is contemplated.

Bathgate, N. D.—Plans for a sewerage system have been completed.

Gaffney, S. C.—Voted to issue $120,000 bonds for installing a sewerage system.

Red Lodge, Mont.—Voted to issue bonds for constructing a sewerage system.

New Britain, Conn.—About 2 mis. of new lateral sewers is contemplated.

Shelbyville, Ind.—Plans are being prepared for a sewerage system.

McKeesport, Pa.—Plans will be prepared for constructing a sewage disposal plant.

Nebraska City, Neb.—Surveys are being made for the extension of the sewerage system.

Yoakum, Tex.—The question of installing a sewerage system is being considered.

Willits, Cal.—About $30,000 will be expended for constructing a sewerage system.

Gaudette, Minn.—Sewerage will be installed this summer, according to press reports.

New Philadelphia, Pa.—This city contemplates the improvement of its sewerage system.

Arlington, Tex.—The question of constructing a sewerage system is under consideration.

Rahway, N. J.—The bd. of health has recommended the construction of about 8 mis. of new sewers.

Hamilton, Ont.—The sewer committee has decided to construct sewers in Chase, Emily and Clinton sts.

Mayfield, Cal.—Voted to issue $37,000 bonds for constructing pipe sewers. W. H. Myrick, town clk.

Muscatine, Ia.—City council has authorized the construction of a trunk sewer on East Hill at a cost of $16,000.

Binghamton, N. Y.—Ordinances have been adopted for constructing storm water sewers in a number of streets.

Parkesburg, Pa.—Plans are being prepared for constructing a sewerage system and sewage disposal plant.

Houston, Tex.—Plans have been adopted for constructing a storm sewer in Austin st. F. L. Dormant, cy. engr.

Utica, N. Y.—The city engineer has been directed to prepare plans for the proposed Highland trunk sewer.

Kenmore, N. Y.—The village board of trustees passed a resolution April 19 for constructing a storm sewer in Myron ave.

Nevada, Ia.—The construction of a sewerage system and sewage disposal plant is contemplated, at a cost of $55,000.

South Bend, Ind.—Plans for constructing a trunk sewer in the West End are about completed. A. J. Hammond, cy. engr.

Ensley, Ala—A resolution has been adopted providing for a vote on the issue of $60,000 bonds for the construction of sanitary sewers.

Winchester, Va.—Special.—C. E. Hoover, supt. water and streets, says this city contemplates installing a sewerage system this summer.

Richmond, Ind.—A resolution has been adopted providing for the construction of a sewerage system in the Fairview section of this city.

Atlanta, Ga.—Plans for the proposed sewerage system will be prepared by Rudolph Hering, of New York City, and will be ready about June 15.

New Bedford, Mass.—The board voted to authorize the expenditure of $14,000 for constructing the Brook st. sewer system. Cy. engr. Williams.

Denver, Colo.—Plans for a storm sewer district to be known as West Denver Storm Sewer Dist. No. 1 are being prepared by J. B. Hunter, cy. engr.

Newark, N. J.—A resolution has been

adopted providing for the construction of a system of storm water sewers in the east side of the city at a cost of about $50,000.

San Francisco, Cal.—Rudolph Hering, of New York City, has been engaged as consulting engineer for sewers and a garbage disposal system, according to press reports.

Bedford, Pa.—Plans for a complete system of sanitary sewers have been completed. Plans for a sewage disposal plant, to consist of a septic tank and sprinkling filters, have also been prepared.

Mankato, Minn.—A report has been submitted to the city council by the bd. of pub. wks. on the proposed construction of a system of storm water sewers in 7 districts. Dr. J. W. Andrews, mayor.

San Francisco, Cal.—This city has been calling the attention of contractors to the fact that the city and county proposes to construct a new sewer system and auxiliary water supply system for fire protection. Chas. A. Day, prest. B. P. W.; Robt. Loughery, secy.

CONTRACTS TO BE LET.

Oshkosh, Wis.—Bids are asked until May 15 for constructing 8 sewers. B. P. W.

Onawa, Ia.—Bids are asked until May 4 for constructing the Eisele ditch. Bd. co. comrs.

Huron, S. D.—Bids are asked until May 14 for constructing 2 main sewers. M. Schoenert, cy. clk.

Basin, Wyo.—Bids are asked until May 71 for constructing a sewerage system. M. O. Barnes, mayor.

Sidney, Ia.—Bids are asked until May 3 for constructing a ditch. G. C. Coleman, co. audt.

Pocahontas, Ia.—Bids are asked until May 11 for constructing ditch No. 36. J. A. Terry, co. audt.

Vernon, Tex.—Bids are asked until May 4 for constructing a sewerage system. R. B. Sherrell, cy, secy.

Plankinton, S. D.—Bids are asked until May 10 for constructing a sewerage system. T. W. Taubman, mayor.

Washington, Ind.—Bids are asked until May 5 for constructing a ditch. A. F. Annem, drainage comr.

Dakotan, Ia.—Bids are asked until May 12 for constructing ditch No. 25. J. G. Devine, co. audt.

Hallock, Minn.—Bids are asked until May 3 for constructing ditch No. 16. C. J. Hemington, co. audt.

Albert Lea, Minn.—Bids are asked until May 27 for constructing a trunk sewer. William Barneck, cy. engr.

Bradley Beach, N. J.—Bids are asked until May 3 for constructing a sewage disposal system. The mayor.

Janesville, Wis.—Bids are asked until May 4 for constructing 3,940 lin. ft. 8-in. sewers. C. V. Kerch, cy. engr.

Williamsport, Ind.—Bids are asked until May 3 for constructing a drain in Jordan twp. J. Rupert Gregory.

Montevideo, Minn.—Bids are asked until May 3 for constructing judicial ditch No. 4. J. J. Stennes, co. audt.

Mt. Gilead, O.—Bids are asked until May 6 for constructing sewers and sewage disposal plant. W. B. Eells, engr.

Montgomery, Ala.—Bids are asked until May 3 for constructing a sanitary sewer in S. Lawrence st. Robt. Tait, cy. treas.

Elizabeth, N. J.—Bids are asked until May 3 for constructing sewers, 3 manholes, 3 catchbasins, etc. N. K. Thompson, st. comr.

Hartford, Mich.—Bids are asked until May 3 for the reconstruction of Eagle Lake drain. John Mutchler, co. drain. comr.

Clinton, Ia.—Bids are asked until May 11 for constructing a branch sewer in dist. No. 4. H. U. Crockett, mayor; Wm. E. Hayes, cy. clk.

Newburg, O.—Bids are asked until May 3 for constructing sewers in Ingersoll road and Woodland ave. E. T. Lawrence, clk. B. P. S.

Brooklyn, Wis.—Bids are asked until May 8 for constructing a drainage ditch in the towns of Oregon, Brooklyn and Union. F. M. Ames, secy.

Barstow, Tex.—Bids are asked until May 18 for constructing a drainage system. T. B. Anderson, J. J. Walker, C. E. Nichols, co. comrs.

Ft. Dodge, Ia.—Bids are asked until May 12 for constructing a drain and ditch in Webster co. drainage dist. No. 52. J. L. Hanrahan, co. audt.

Logansport, Ind.—Bids are asked until May 4 for constructing a vitrified clay pipe sewer from the Orphans' Home to the city sewer system. Chas. R. Laybrook, co. engr.

Cleveland Heights, O.—Bids are asked until May 3 for building sewers in No. Woodland road; also joint sewers. Wm. H. Evers Engrg. Co., Arcade, Cleveland.

Lindsborg, Kan.—Bids are asked until May 10 for constructing 4,390 ft. of 15-in., 2,300 ft. 12-in., 3,000 ft. 10-in. and 29,200 ft. 8-in. pipe sewers, 66 manholes, etc. Andrew Monson, cy. clk.; H. A. Rowland, engr., McPherson.

Columbus, O.—Bids are asked until July 15 for constructing a retaining wall around the settling basins of the sewage purification works adjacent to Scioto river, ¼ mi. south of Frank road. E. W. Hirsch, secy. B. P. S.

Mobile, Ala.—Bids are asked until May 12 for constructing 33,000 lin. ft. of 10 to 30-in. pipe sewers; 30,000 lin. ft. 6-in. house connections with manholes, catchbasins, inlets and other appurtenances. Wright Smith, ch. engr.

Syracuse, N. Y.—Sealed bids are asked until May 18 for constructing a main intercepting sewer with connections, involving 2 1-3 mis. main intercepting sewer, 92,000 cu. yds. excavation, and 6,000 cu. yds. concrete. Harry J. Hamlin, secy. Syracuse Intercepting Sewer bd.

CONTRACTS AWARDED.

Vancouver, B. C.—The contract for sewer pipe was awarded to Evans, Coleman & Evans for $43,620.

Clay Center, Kan.—E. D. Reed was awarded the contract for constructing a main sewer for $9,463.90.

Julesburg, Colo.—The contract for constructing a sewer was awarded to S. G. Magden, of Des Moines, Ia., for $25,000.

Algona, Ia.—The contract for constructing ditch No. 9 has been awarded to Ward Bros. of Audubon, Ia., for $61,000.

Canton, Ga.—The contract for constructing about 2 mis. of sewers has been awarded to J. B. McCrary & Co. for $4,000.

Wooster, O.—The contract for building a storm sewer in Washington ave. was awarded to Geo. Dennis for $3,103.90.

Crown Point, Ind.—The contract for constructing the Niles ditch was awarded to Hack & Son, of Lowell, for $16,009.87½.

Norwich, Conn.—The contract for constructing a new dam at Bog Meadow was awarded to Thos. J. Dodd, of this city, for $8,695.

Farmer City, Ill.—The contract for constructing a sewerage system was awarded to Howes Bros., of Chicago, for $16,886.15.

Abilene, Kan.—The contract for constructing a sewer on the west side of town was awarded to Johnson & Johnson, of Kansas City.

Nashville, Tenn.—Geo. W. Powell secured the contract for building a sewer in Madison st. and alley No. 557 for 31,708.50.

South Bend, Ind.—Contracts for constructing 4 mis. of ditch have been awarded to Gus Krinke, Leon Gottien and Frank Straus.

Oxford, O.—The contract for constructing a sewage disposal plant was awarded to F. M. Benner & Co., of Marion, Ind., for $15,171.

Hutchinson, Kan.—The contract for extensions to the East Side sewer and a submain was awarded to Davis & Heiser for $3,096.38.

Utica, N. Y.—The contract for constructing storm water sewer south of the city was awarded to Rocco Perretta for $13,902.20.

Hoboken, N. J.—Patrick Connelly has been awarded the contract for constructing the Jackson ave. outlet parallel sewer for $217,339.

Winchester, Va.—The contract for installing a system of small pipe sanitary sewers was awarded to Irwin Bros., of Greenville, O., for $33,000.

Jefferson, Wis.—The contract for constructing sewers in sewerage dist. No. 2 was awarded to Jas. McCabe, of Fond du Lac, for about $10,000.

Millville, N. J.—The contract for constructing a sewage disposal plant was awarded to Thomas & Watkins, of Wilkesbarre, Pa., for about $25,000.

West Allis, Wis.—The contract for constructing a sanitary sewerage system and septic tank and filtering beds was awarded to David West for $39,950.

Philadelphia, Pa.—The contract for constructing 4,150 ft. of storm sewer through the streets of the property of the Roberts Realty Corporation was awarded to T. H. Riddle.

Indianapolis, Ind.—The contract for constructing a local sewer in Dearborn st. from Washington to New York sts. was awarded to the Sheehan Construction Co. at $1.19 a ft.

Louisville, Ky.—The Blackstaff Engineering Co., of Philadelphia, was awarded the contract for constructing section G, southern outfall sewer, contract No. 29, for $85,428.

Calgary, Alta.—The C. P. R. irrigation department has awarded a contract for the excavation of more than 600 mis. of canals and ditches to Foley, Welch & Stewart.

Winchester, Va.—The contract for constructing a system of sanitary sewers and intermittent filtration plant was awarded to the Central Construction Co., of Parkersburg, W. Va.

Allentown, Pa.—Bids were submitted April 20 for constructing sewers in Sumner ave. and Chestnut, 6th and Race sts. by Geo. W. Meinholz, Geo. H. Hardner and Weaver Contracting Co.

Salt Lake City, Utah—Special.—The contract for connecting the Fifth South st. sewer with the intercepting sewer was not awarded, the lowest bid, submitted by Zerbe & Walker, being rejected.

Guthrie, Okla.—The contract for constructing a storm sewer in the flood district on the west side of Logan ave., from 9th st. to the Cottonwood river, was awarded to W. F. Power, of this city, for $9,685.

Philadelphia, Pa.—Contracts for constructing sewers in short sections of streets, aggregating $150,000, have been awarded to David McMahon, Wm. D. Peoples, Nicholas Connel, Patrick Durkin, Joseph Lombardi and Dornato Delasse.

Chicago, Ill.—Contracts for constructing a large number of sewers have been awarded to Thos. Burke, Tony Ross, Simon Ryan, Michael Pontorelli, Nick Mancini, James Flaherty, Howes Bros. Co., Jas. J. Renn, Jas. H. Roche, David Walsh, Daniel Hardin, John W. Brunt and Malachi Murphy.

East St. Louis, Ill.—Special.—Dixon & Smith, engrs., Wright Bldg., St. Louis, have been appointed consulting engineers to revise the plans and specifications and supervise the erection of the sewage pumping station, the contract for which has been let to O. T. Dunlap & Co. for $200,000.

Denver, Colo.—The Denver & Pueblo Construction Co., of this city, was awarded the contract for constructing sewers in sub-districts Nos. 2 and 6 of the North Denver storm sewer dist. No. 1, for $16,069 and $15,021, respectively. W. M. Porter secured the contracts for Nos. 3 and 4, for $15,369 and $18,347, respectively.

Baltimore, Md.—Contracts for constructing sanitary sewers were awarded April 7 as follows: Sanitary contract No. 38, including 31,600 ft. of terra cotta pipe sewer, 8 to 15 in. diam., and 17,000 ft. 6-in. terra cotta house connections, to Ryan & Reilly, Baltimore, for $50,776, and sanitary contract No. 39, including 24,025 ft. of terra cotta pipe sewer, 8 to 20 in. diam., and 13,500 ft. 6-in. terra cotta house connections, to Jas. Ferry & Sons, Crafton, Pa., for $42,783.

Wilkesbarre, Pa.—Contracts for constructing sewers in 33 streets and protecting the Horton st. sewer outlet have been awarded as follows: Section 1, to the D. M. Rosser Engineering & Construction Co., of Kingston, at $11,419; Section 2, to C. M. Riley, of Wilkebarre, at $19,978; Section 3, to the Pennsylvania Sewer Co., at $17,049; for furnishing sewer pipe to Geo. N. McAlarney, of Wilksbarre, for all three sections, at $9,153.

Watertown, N. Y.—W. J. Semper was awarded the contract for constructing the western outfall sewer, using reinforced concrete pipe made by the Reinforced Concrete Pipe Co., of Jackson, Mich., as follows: 2,800 lin. ft. 36-in. reinforced concrete tile, $8.33; 2,600 lin. ft. 33-in., $5.39; 1,760 lin. ft. 30-in., $3.05, and 2,264 lin. ft. 27-in., $2.56; 100 lin. ft. 6-in. house connections, 35 cts.; 350 6-in. Y's in concrete, 8 cts; 350 6-in. slants, 18 cts.; 350 6-in. Y's, vitrified, $4.80; 16 manholes, $80; six lampholes, $16; 10 M. ft. timber and plank, $30; 1,000 cu. yds. extra concrete, $4.97; 100 cu. yds. extra earth excavation, 68 cts.; 100 cu. yds. extra rock excavation, $3.25.

North Andover, Mass.—Bids for constructing sewers were submitted April 15 as follows: Andrew W. Bryne & Co., 161 Devonshire st., Boston, $17.084; T. Bruno, 76 Vane st., Revere, $20,318; W. B. Bryne, Journal. Bldg., Boston, $19,524; John H. McCusker, 62 Church st., Waltham, $19,916; Coughlan & Shiels Co., 43 Tremont st., Boston, $26,434; Cenedella & Co., Milford, $18,424; Chas. G. Craib, 249 Pleasant st., Winthrop, $16,056; Antonio G. Tomasello, 69 Gigson st., Dorchester, $19,897; Edward B. Roberts, 730 Old South Bldg., Boston, $19,401; Bryne Contr. Co., 40 School st., Boston, $17,325; Frank H. Cowin Co., 184 Summer st., Boston, $23,748; John J. Falvey, 15 Rush st., Somerville, $23,501; The Henry Spinach Contr. Co., Waterbury, Conn., $23,178; C. E. Trumbull Co., 1121 Tremont Bldg., Boston, $16,820; John F. Gill Co., Winter Hill, $17,375, and Michele Russo & Son, 240 North st., Boston, $16,741.

WATER WORKS.

Weston, W. Va.—The Highland Distributing Co. has been incorporated to build

water works for public and private use, by W. W. Brannon, Lloyd Beeghley, Claude Rinehart and others.

Salt Lake City, Utah—The Rasmussen Springs Water Co., of Clarkston, Cache co., has been in corporated to install and operate a water system in that county. Sidney Rasmussen is president; Phillip Rasmussen, vice-president; Aaron Rasmussen, secretary and treasurer.

Gibson City, Ill.—On account of many complaints on the part of customers that they had to pay too much for water, since the installation of meters, the city council has decided to revise the rates, giving the large consumers a wholesale rate. The new schedule is as follows: For 5,000 gallons or under 30 cts. per 1,000 gallons; for 10,000 gallons, 25 cts. per 1,000; for 15,000 gallons, 20 cts. per 1,000; for 30,000 gallons, 15 cts. per 1,000; for 40,000 gallons, 12 cts. per 1,000, and for 100,000 gallons, 10 cts. per 1,000. Those who use as much as 200,000 gallons are given a rate of ¾ ct. per 100 gallons. The minimum rate of $4 a year still stands, but after this will be paid in quarterly installments.

CONTEMPLATED WORK.

Marcellus, N. Y.—Voted to construct municipal water works.

Wheatland, Wyo.—A water works system is proposed.

Baudette, Minn.—A water works system will be constructed.

Little Rock, Ia.—Voted to build a water works system.

Rippey, Ia.—Voted to construct water works.

Western, Neb.—Voted to issue bonds for constructing a water works system.

Savannah, Ga.—The extension of the water mains southward is contemplated.

Oak Park, Ill.—A municipal water works system is contemplated.

Kerens, Tex.—The establishment of a water works system is contemplated.

Halstead, Kan.—Voted to issue bonds for installing a water works system.

Elmer, N. J.—Voted to issue bonds for acquiring a municipal water works system.

Atlanta, Tex.—Voted to issue bonds for constructing a water works system.

Paris, Tex.—A filtration plant is contemplated. Edward McCuiston, mayor.

Fountain Green, Utah—The construction of a water works system is contemplated.

Lewisville, Ind.—Council has decided to construct a water works system.

Diller, Neb.—The question of constructing water works is under discussion.

Rosalia, Wash.—The Rosalia Water Co. contemplates installing a new pump at once.

Halstead, Kan.—Voted to issue bonds for constructing a water works system.

Hawley, Minn.—Voted favorably on the question of constructing water works.

Lodi, Cal.—Special.—Cary Bros. are in the market for a steel tank and c. i. pipe.

Greenfield, Ia.—Will vote May 10 on the question of erecting a water works system.

Yellowgrass, Sask.—Voted to appropriate money for constructing a water works system.

Iroquois, S. D.—Voted to issue bonds for the improvement of the water works system.

Evansville, Ind.—Plans are being prepared for a large filtration plant by Frank N. Spencer, of Toledo, O.

Dubuque, Ia.—The bd. of w. w. trustees contemplate constructing several hundred feet of water mains.

Dallas, Tex.—Voted to issue $500,000 bonds for the construction of a reservoir in the White creek bottoms east of this city.

San Angelo, Tex.—The water works and electric light co. contemplates improvements to the system to cost about $25,000.

Bridgeville, Del.—Legislature has passed a bill to permit this city to issue bonds for constructing a water works system.

San Gabriel, Cal.—Special.—G. G. Longhurst advises us that he is in the market for pumping machines, oils and general supplies.

Wheeling, W. Va.—The question of installing a new pump and constructing a filtration plant for the water works system is being discussed.

Tacoma, Wash.—Special.—William B. Short, 2207 N. Proctor st., is in the market for steam pumps, air compressors, c. i. pipe and specials.

Verona, N. J.—An ordinance has been introduced empowering the water committee to purchase a site for the erection of a standpipe in this borough.

Greenfield, Ind.—A petition is being circulated asking that a special election be held to appropriate $25,000 for the construction of a water works system.

Celina, O.—Special.—A. W. Fishbaugh, C. E. and surveyor, desires the addresses of companies supplying water works supplies, c. i. pipe, hydrants and valves.

San Francisco, Cal.—The city and county have called the attention of contractors to the proposed construction of an auxiliary water supply system for fire protection. Chas. A. Day, prest. bd. pub. wks.

Wilmington, N. C.—Special.—John J. Fowler, clk. and treas., advises us that this city has acquired the water works plant of the Clarendon Water Works Co., of said city, and will proceed to enlarge same. The work will be performed under the supervisions, direction and control of a commission consisting of C. W. Worth, chairman, W. E. Perdew and Marcus W. Jacobi.

Jacksonville, Ala.—Special.—J. A. Gaboury, prest. Jacksonville City Water Works, advises us that, having guaranteed the municipality to enlarge the water mains, thereby furnishing an adequate supply of water for domestic purposes, and also a fire pressure of 100 pounds, the city council at their last meeting declared the recent bond election, for the purpose of building a municipal plant, null and void.

Macon, Ga.—Special—This city contemplates the purchase of the water works system now owned by the Macon Gas Light and Water Co. Hazlehurst & Anderson, Candler Bldg., Atlanta, Ga., consulting engrs., associated with Chas. A. Caldwell, civ. eng. of Macon, Ga., have been retained to make an appraisement of the existing works, and to design a complete new system at an estimated cost of $750,000.

CONTRACTS TO BE LET.

Velva, N. D.—Bids are asked until May 4 for constructing water main extensions.

Bisbee, Ariz.—Bids are asked until May 4 for furnishing 3 steel tanks. Geo. S. Gage, cy. clk.

Denison, Tex.—Bids are asked until May 10 for constructing an earth dam. J. D. Yocum, cy. secy.

Hugo, Okla.—Bids are asked until May 4 for constructing water works. W. T. Echols, cy. clk.

Chaska, Minn.—Bids are asked until May 3 for the extension of the water mains. J. M. Aretz, cy. clk.

Newton, Ia.—Bids are asked until May

3 for constructing 10 blocks of water pipe. E. G. Finch, cy. clk.

Vernon, Tex.—Bids are asked until May 4 for constructing a water works system. R. B. Sherrell, cy. secy.

Plankinton, S. D.—Bids are asked until May 10 for constructing a water works system. E. F. Mackey, cy. audt.

Madisonville, Ky.—Bids are asked until June 1 for purchase of a water works franchise. Jas. L. Brown, cy. clk.

Estevan, Sask.—Bids are asked until May 19 for constructing a water works system and main sewer. L. A. Duncan, secy.-treas.

Union Mo.—Bids are asked until May 3 for constructing a new concrete reservoir. Geo. H. Vossbrink, water comr. and cy. clk.

Galveston, Tex.—Bids are asked until May 12 for constructing an 8-in. main across Galveston Ship Channel. A. T. Dickey, cy. engr.

Lennox, S. D.—Bids are asked until May 3 for constructing 2,600 ft. of 4-in. water mains, with 7 hydrants. Simon Smith, cy. audt.

Petaluma, Cal.—Bids are asked until May 5 for furnishing and installing pumping machinery for salt water high pressure system. Cy. clk.

Toronto, Ont.—Bids are asked until May 18 for constructing the necessary works in connection with a water filtration plant. C. H. Rust, cy. engr.

Charleston, S. C.—Bids are asked until May 3 for constructing 4,000 ft. of concrete retaining wall and for filling same. J. H. Dingle, cy. engr.

Ft. McKinley, Me.—Bids are asked until May 7 for extending the water and swere lines at Ft. McKinley and Williams, Me. Capt. F. J. Morrow, constr. Q. M.

Washington, D. C.—Bids are asked until May 6 for furnishing an air compressor, cypress water tanks, etc. Capt. F. C. Boggs, genl. purchasing agt., Isthmian Canal Comn.

Manila, P. I.—Bids are asked until June 1 for furnishing 7,000 tons of c. i. pipe, hub and spigot; 56 tons 20-in. c. i. pipe; 2 tons flanged c. i. pipe; 200 tons c. i. specials. J. F. Chase, ch. engr. dept. sewers and water.

Columbus, O.—Bids are asked until May 12 for construction work on the Miami and Erie canal, requiring 5 locks to be built between Dayton and Cincinnati; 2 locks south of Defiance; a feed dam at Troy; a feed gate at Middletown; 5 culverts at Paulding, and numerous mud-catchers. State bd. of pub. wks.

CONTRACTS AWARDED.

Elkhart, Ind.—A new 25-yr. franchise has been granted the Elkhart Water Co.

Boulder, Colo.—The contract for installing a water works system has been awarded to Doyle & Schwartz.

Tacoma, Wash.—The Northwest Bridge Co. submitted the lowest bid for constructing a new standpipe, $12,503.

McPherson, Kan.—The contract for water main extensions was awarded to Buchanan & Stack, of Selina, for $1,700.

Swanton, O.—The contract for constructing a water works system has been awarded to Young & Gray, of Toledo, O., for $10,268.

Carthage, Mo.—A contract for constructing a water works system has been awarded to M. A. Earl & Co., of Muskogee, Okla., for $220,000.

Jacksonville, Fla.—The contract for furnishing a pump has been awarded to the Allis-Chalmers Co., of Milwaukee, Wis., for $10,678.

Parsons, W. Va.—The Central Construction Co., of Parkersburg, W. Va., was awarded the contract for constructing a water works system for about $30,000.

Philadelphia, Pa.—The contract for constructing the Queen Lane filtration plant was awarded to the Millard Construction Co., Penn Bldg., for $1,832,000.

Nashville, Tenn.—The contract for constructing 23,046 ft. of water mains in various parts of the city was awarded to Sullivan & Haggerty, for $5,811.

Hubbard, Tex.—The contract for constructing a water works system and electric light plant was awarded to G. T. Blackford, of Knoxville, Tenn., for $499,-550.

New York City—The contract for constructing 6 mls. of the Catskill aqueduct in the towns of Shawangunk and Montgomery was awarded to the American Pipe and Construction Co., of Philadelphia, for $1,558,695.

Schenectady, N. Y.—Thos. R. Crane has been awarded contracts for laying water mains in Oneida, Turner and Wanner sts. at the following prices: 28 cts. per lin. ft. for 8-in. pipe and 24 cts. for 6-in. pipe.

Cheyenne, Wyo.—The contracts for supplying c. i. pipe, lead and hemp were awarded, April 5, as follows: Pipe, U. S. Cast Iron Pipe and Foundry Co., Chicago, at $260,814, and the contract for lead and hemp to M. J. O'Fallon Supply Co., Denver, Colo., at $84 per ton for 200 tons of lead and $49 per ton for 15 tons of hemp.

Toledo, O.—Contracts were awarded, April 11, as follows: To the Wickes Boiler Co., Saginaw, Mich., for pipe needed in filtration work contract, for about $7,557; Norwood Eng. Co., Florence, Mass., for special castings, $1,825, and the U. S. Cast Iron Pipe and Foundry Co., for specials, $3,370.

New Bedford, Mass.—Contracts for furnishing water meters were awarded, April 20, as follows: H. R. Worthington, ⅝ and 1-in. sizes, $6.50 and $13.50, respectively; Union Water Meter Co., 60 ⅝-in. meters, with ⅝-in. connections, for the sum of $400; 30 ¾-in. meters, with ¾-in. connections, for the sum of $315; 6 1½-in. meters, with 1½-in. connections, for the sum of $155; 48 2-in. meters, with 2-in. connections, for the sum of $2,060; Thomson Meter Co., Brooklyn, N. Y., Lambert meters, 3, 4 and 6-in. sizes, $80, $160 and $320, respectively.

BRIDGES.

Lake Village, Ark.—A bridge across Lake Chicot is contemplated.

Cleveland, O.—Bids are asked until May 12 for constructing a bridge. William F. Black, co. clk.

North Tonawanda, N. Y.—The business men are in favor of building lift bridges over the Barge Canal.

Schenectady, N. Y.—Mayor Van Voast has plans for a new reinforced concrete culvert over Villa road.

Newport, Ind.—Bids are asked until May 3 for constructing 2 concrete bridges. H. T. Payne, co. audt.

Swanville, Minn.—Bids are asked until May 25 for building a steel bridge and abutments. Co. comrs.

Okemah, Okla.—Will vote June 11 on the issue of bonds for constructing bridges throughout the county.

Hammond, Ind.—Bids are asked until May 3 for constructing 3 wooden truss bridges. Chas. A. Johnson, co. audt.

North Bend, O.—Bids are asked until May 7 for constructing a concrete arch bridge on Old State road. Co. comrs.

Tipton, Ind.—Bids are asked until May

3 for the construction and repair of 5 bridges. J. F. Barlow, co. audt.

Rensselaer, Ind.—Bids are asked until May 3 for constructing steel bridges. Jas. A. Leatherman, co. audt.

Lebanon, Ind.—Bids are asked until May 4 for constructing and repairing 7 bridges. B. F. Herdrich, co. audt.

Goshen, Ind.—Bids are asked until May 4 for constructing and repairing a number of bridges. D. O. Batchelor, co. audt.

Doylestown, Pa.—Bids are asked until May 10 for constructing 4 concrete bridges. Cornelius T. Haldeman, co. comr.

Decatur, Ind.—Bids are asked until May 3 for the construction and repair of a number of bridges. H. S. Michaud, co. audt.

St. Paul, Minn.—The house passed a bill to permit this city to issue bonds for the construction of a new bridge across the Mississippi river for wagon traffic.

Wilkesbarre, Pa.—Bids are asked until May 7 for constructing steel, stone arch and concrete bridges. Jas. M. Norris, co. compt.

Columbus, Ind.—Bids are asked until May 3 for constructing a steel truss bridge and reinforced concrete arch. John M. Davis, co. audt.

Norway, Mich.—Bids are asked until May 4 for constructing a new steel bridge across Sturgeon river at New York farm. Henry Grand, comr. highways.

Gaspe, Que.—Bids are asked until May 21 for constructing the steel superstructures of 14 bridges and trestles. New Canadian Co., Ltd., New Carlisle, Que.

Savannah, Ga.—Bids are asked until May 3 for constructing a reinforced concrete lock and bridge at Buckhalter Canal Outlet. G. Reuben Butler, clk. circuit court.

Toledo, O.—Bids are asked until July 1 for constructing a reinforced concrete arch bridge over Maumee river at Cherry st. Reynold Voit, secy. B. P. S.

Chicago, Ill.—Bids are asked until May 5 for constructing sec. 7 of the North Shore Channel and performing certain collateral bridge work. Bd. trus. Sanitary Dist.

Connersville, Ind.—Bids are asked until May 5 for constructing a concrete bridge, a new concrete floor in Lockhart bridge, and new wooden floor in John Henry bridge. Jasper L. Kennedy, co. audt.

STREET LIGHTING.

Sparta, Wis.—An electric light plant is contemplated.

Upland, Cal.—Bids are asked until May 10 for a gas franchise. Cy. clk.

Clarksburg, Mo.—Plans are being considered for installing an electric light plant.

Americus, Ga.—The installation of a municipal electric lighting plant is contemplated.

Danbury, Ia.—Plans are being considered for installing a municipal electric light plant.

Richwood, O.—Will vote May 10 on the issue of bonds for constructing a municipal light plant.

Vincennes, Ind.—Bids are asked until June 8 for lighting the streets of this city. B. P. W.

Chester, Pa.—The Suburban Gas. Co. has decided to expend $100,000 in improving the equipment and service of its plant.

Snyder, Tex.—The contract for constructing an electric light plant was awarded to Brumbach & Couch, of Cleburne.

Bridgeport, O.—Bids are asked until May 1 for lighting this village with gas or electricity. R. T. Michener, vil. clk.

Decker, Ind.—The Hydro-Electric Co. contemplates erecting a water power plant near here. Eugene Rush, prest., Vincennes.

Providence, R. I.—A contract for constructing a coal gas plant at Sassafras Point has been awarded by the Providence Gas Co.

Port Jervis, N. Y.—The Port Jervis Light and Power Co. has been incorporated to manufacture gas and electricity for light, heat and power.

Boston, Mass.—A contract for lighting the streets has been awarded to the Edison Electric Illuminating Co. for 10 yrs. at $300,000 a year.

Greenville, N. C.—Bids are asked until May 4 for building a power house and infirmary at Teachers' Training School. Thos. Jarvis, chmn. ex. com.

Rushville, Ind.—Bids are asked until May 14 for furnishing engine, piping, generator and exciter to be installed in the municipal electric light plant. Harvey M. Cowing, mayor.

Portland, Ore.—Bids are asked until May 14 for lighting the streets, avenues, buildings and public places with incandescent lights for 3 or 5 yrs. Bids are also asked for lighting the buildings, etc., with gas. A. L. Barbour, cy. audt.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Goshen, Ind.—The contract for hauling the city garbage has been awarded to J. M. Weaver for $14.50 per week.

Knoxville, Tenn.—The contract for city sprinkling has been awarded to the Knoxville Cleaning and Sprinkling Co.

Wilmington, Del.—Bids are asked until May 3 for the collection and removal of garbage in 4 districts. Bd. of health.

Milwaukee, Wis.—The contract for constructing a garbage crematory on Jones Island has been awarded to the Power Specialty Co., of New York City, for $174,384.25.

Columbus, O.—Bids are asked until May 11 for constructing a garbage reduction works on city land, including designs, buildings, delivery, etc. E. W. Hirsch, secy. B. P. S.

PARKS.

Alton, Ill.—An addition to Rock Spring Park has been purchased.

South Pasadena, Cal.—Efforts are being made to obtain Garfield Park for a city park.

Plainfield, N. J.—This city has been offered 70 acres of land for park purposes.

Terre Haute, Ind.—This city has voted to appropriate $12,500 for the purchase of Parsons Field for a park.

Decatur, Ill.—An offer of land 60 ft. wide on the south bank of the river from the county bridge west has been made to this city, without recompense, for a city park.

FIRE APPARATUS.

Vincennes, Ind.—Bids are asked until May 4 for erecting 2 fire department buildings. C. L. V. Tucker, cy. clk.

Washington, D. C.—Bids are asked until May 6 for a fire alarm system. Capt. F. C. Boggs, genl. purchasing agt., Isthmian Canal Comn.

The Recent Bitulithic Decision

It has been the policy of The Barber Asphalt Paving Company to give to municipalities of this country the free use of its discoveries and improvements in the manufacture and laying of roadway pavements, and in line with that policy this Company proposes to maintain so far as possible the position it has taken with reference to the bitulithic patents.

The position of this Company with relation to the next step necessary in the litigation now pending is clearly indicated in the appended letter of our Counsel.

The Barber Asphalt Paving Company
Land Title Building, Philadelphia

LAW OFFICES OF
FRALEY & PAUL, 1815 LAND TITLE BUILDING
BROAD STREET, BELOW CHESTNUT

PHILADELPHIA, January 26, 1909.

THE BARBER ASPHALT PAVING CO.,
LAND TITLE BUILDING,
PHILADELPHIA, PA.:

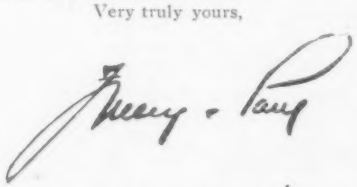
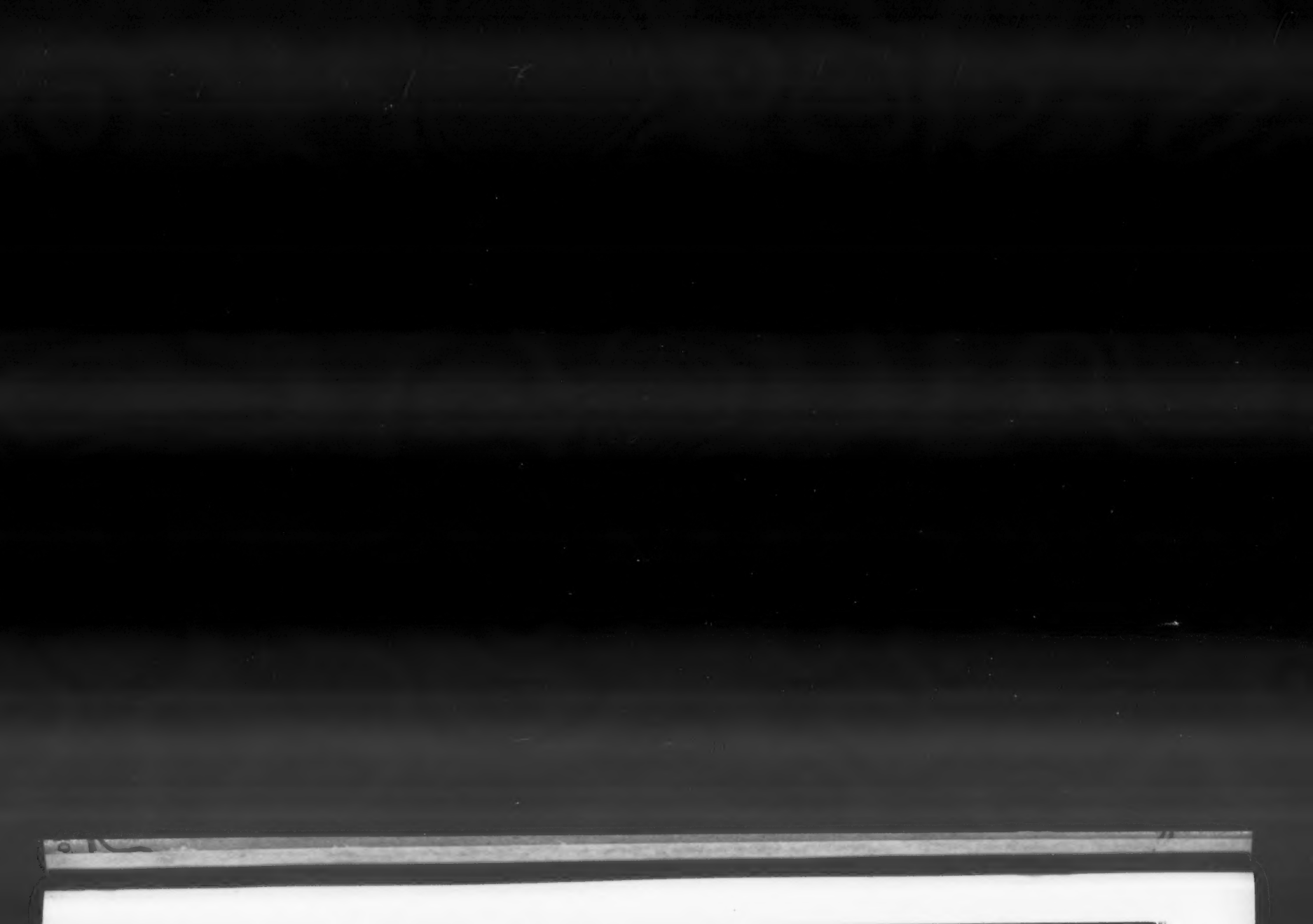
GENTLEMEN—You have asked us for a statement as to the effect of the recent decision of the United States Circuit Court of Appeals for the Sixth Circuit in the suit of Warren Brothers against the City of Owosso. We have now secured a copy of the decision, and find that it is based upon a single narrow point, reversing the decree of the lower court upon this point, and remanding the case for an accounting.

The suit against the City of Owosso was on Warren's Patent No. 727,505, and your defense, among other matters, asserted that this patent was anticipated by the pavement which you had laid in front of your office in Long Island City in the year 1896. It was not contended that the pavement which you laid in the City of Owosso, and which was charged to infringe the Warren Patent, differed in structure in any way from your prior pavement, and the lower court dismissed the Warren suit. The Court of Appeals reverses this adjudication, holding that your pavement in Long Island City was an abandoned experiment. The evidence in the case showed without contradiction that your pavement was laid in 1896, as an improvement to your real estate; that it was entirely successful as a pavement; that it has remained ever since as the pavement of this part of one of the highways of New York City; and the Chief Engineers of the Borough of Manhattan, and also of the Borough of Brooklyn, testified that it was still a good, serviceable pavement after ten years of use, and probably destined to last as much longer.

We are not satisfied with the reasoning of the court which holds such a paving operation to be an abandoned experiment, and it does not seem to us to accord with the general trend of patent decisions, or the understanding of the patent bar, in relation to abandoned experiments. We are, therefore, in accordance with your instructions, preparing an application to the Supreme Court of the United States asking for a writ of certiorari to bring the case before that court, where we shall endeavor to secure a reversal of the decision which has been rendered.

The opinion of the Court of Appeals, as is usual in patent suits against a municipality, does not direct the issuance of an injunction.

Very truly yours,



For booklets giving the history of the Bitulithic Litigation, Address General Agent, The Barber Asphalt Paving Company, Land Title Building, Philadelphia.